Your Personal Guide to

This manual was prepared exclusively for

on

by

Living Younger

Your Personal Guide to Optimum Aging

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Living Younger

Have you or someone you know experienced one or more of the following:

- Heart disease
- Cancer
- Stroke
- Diabetes
- Alzheimer's disease

If you answered yes, then you have witnessed an example of the pathologic diseases of aging. If you answered yes and the person is approximately your age or even younger, then you also know someone who died prematurely. If it was a friend, has it made you consider your own mortality? If this was a family member, have you wondered whether you, too, are destined to a similar fate? If you answered yes, then this book may be just what the doctor ordered.

If you have been diagnosed with one of these conditions you are part of a rapidly growing segment of our population who is aging faster than is necessary. The chronic diseases of aging are among the greatest challenges facing our country and the health care system.

Glance around the waiting room in your doctor's office and many of the people you see are likely to have more than one chronic illness, even if they are only in middle age. How common are chronic illnesses? The findings from a study reported in a 2005 issue of Annals of Family Medicine may surprise you. Ninety percent of adults treated by doctors had more than one chronic illness. In addition, nearly half of the patients aged 45-64 had five or more chronic conditions. The Centers for Disease Control estimate that at least 125 million Americans are affected by chronic diseases, at a cost of more than $500 billion per year. What makes this so tragic is the fact that the overwhelming majority of these conditions could have been prevented.

According to the U.S. Centers for Disease Control, 1,250,000 Americans suffer heart attacks each year, while 710,000 die of heart disease, with most of these following long periods of debilitation. Cardiovascular disease causes 1 of every 2.7 deaths in the United States today. Cancer kills more than 500,000 Americans each year. Strokes account for another 168,000 deaths and diabetes conservatively kills 70,000 more. These sobering statistics are not lost on a growing number of individuals choosing a physician specialized in preventive-aging medicine. Perhaps a close friend, with whom they share a similar lifestyle, has just suffered a heart attack or was diagnosed with cancer. It might be a parent succumbing to the ravages of Alzheimer's disease. Possibly everyone in their family died at an early age and they, too, are rapidly approaching the same age.

The number-one motivator for looking into the preventive-aging medicine option, however, is one's personal experience of premature aging. All too often, people have already been diagnosed with measurable signs of aging-related disease – hypertension,

high cholesterol, or osteoporosis, for example. Typically, they report a decline in their former physical ability, a personal sense of imbalance in life, or a faltering sense of youthful vitality – loss of strength, fatigue, inability to concentrate, loss of libido or sexual performance, frequent illnesses, and so forth.

Life is truly a marvelous journey; a continuous process of change, followed by growth. Each and every one of us should be able to fully embrace and enjoy every stage of life to its fullest. Sadly, even in this day of modern medical miracles, too many of us have chosen to live in the 'dark ages.' By that, I mean the declines that come with aging are far more related to a lifetime of unenlightened choices than they are to the inexorable ticking of a clock.

All things and all phenomena are connected – especially when it comes to physical function and performance, and youthful vitality. Our every choice, thought and action plays a major role in how well or how long we live.

The mission of this book is to demystify the processes of aging and give you the knowledge, tools, and skills needed to live the life you have imagined. Modern science has begun to unlock the long-hidden mysteries of aging, providing hope for a brighter future for the millions of aging baby boomers and those to follow. Ironically, much of the wisdom for avoiding premature disease and death preceded modern medicine by more than 800 years. The twelfth century physician Maimonides understood the importance personal choice has regarding human longevity: "Live sensibly – among a thousand people, only one dies a natural death; the rest succumb to irrational modes of living." I hope that it won't take another 800 years for us to heed this sage advice. Think of this book as your personal guide to living sensibly – for living younger.

Time Travel and Turning Back the Clock: A look at Life Expectancy and Maximum Lifespan

To know what it means to live younger, we will look at what it means to live older. This section will briefly examine the concepts of human life expectancy and lifespan. To do that let's travel back in time, and trace the evolution of human lifespan. Your journey to living younger, then, begins in the distant past.

Life expectancy is the average number of years that a person is expected to live in a given population. Some people die following a very long life. Others die quite young. Most, however, fall (sic) somewhere in between. Imagine the shape of a bell curve to describe this life expectancy distribution. Through most of human history, the average life expectancy was actually relatively brief. Early man, through prehistoric times, had a life expectancy of less than 25 years. This is rather brief when compared with the average American, who can expect to live about 78 years – triple that of our early ancestors. Why was it so short? Animals living in the wild offer a clue.

Very few animals in the wild die of old age. Most often, something causes an early demise. For the most part, predators kill them, or they die from starvation or environmental factors (e.g., drought, climate extremes, infectious organisms, etc). Very

few ever escape these life hazards and live long enough to die of old age. Actually, the same thing happened to us in our early history. We, too, were killed by predators or other humans; we died from starvation or significant climate extremes.

Another way to understand the relatively brief life expectancy of early man is by examining the ends of the bell curve distribution for life expectancy. At the beginning of the bell curve are those who die young. Newborn and infant mortality was very high throughout most of human history. When a large proportion of a species dies at a very young age, the overall average life expectancy is reduced significantly. Then, at the opposite end of the life expectancy bell curve are the oldest. Historically, when people became ill, injured, or feeble little could be done to sustain life and they died, driving down the average life expectancy for the species.

It has been only in the past 150 years or so that humans experienced significant gains in life expectancy. In fact, the average life expectancy in the U.S. reached an all-time high of 77.6 years in 2004. That essentially means we have tripled our life expectancy when compared to early man. Such a dramatic increase in life expectancy over an amazingly short period in human history might raise the question whether we have learned to slow or turn back the clock of human aging. Would Ponce de Leon, who searched in vain for the fountain of youth, believe we have found it?

I don't think so, at least not yet. How then, can we explain such a dramatic increase in human life expectancy? Recall the fate of the animal in the wild, and that of most of humans throughout our past. Few were lucky enough to survive environmental extremes, other predators, or drought and famine long enough to succumb to old age. Now, let's look at another scenario. Take an animal out of the wild and place it behind bars in a zoo. Feed it daily and control its environment. It doesn't take a rocket scientist to realize that the animal is now protected from predators by the cage. And, lack of food or water is no longer an issue. Moreover, the environment ceases to exert a major threat to its survival. As a result, many more animals in a zoo than in the wild will live long enough to die of old age. You know what? The same thing happened to us, too. We learned to protect ourselves from most predators and other environmental threats. Modern agriculture has insured that we always have plenty of food. Therefore, more humans now live long enough to die of old age.

The bell curve of human life expectancy reveals another reason for the dramatic increase in life expectancy. Recently, by human history standards, we learned to improve, effectively and rather significantly, survival for those at either end of the curve – the very young and the old. Beginning at the youngest ages, many more newborns and infants survive today than in the past. Thanks to sanitation, prenatal care, immunizations, antibiotics and numerous other improvements in living conditions during the last century, the chances of surviving birth and early infancy improved dramatically. Increasing survival of the very young increases the overall average for life expectancy significantly for humans. Now let's examine the opposite end of the curve. This time, because of many of the same things that improved newborn survival, along with modern medical advances for treating diseases of aging, and organized support systems, many

more people formerly near the end of life now continue to survive much longer. Because of this recent phenomenon, it has been said that the majority of people who have ever lived beyond 65 years, in all of history, are living today!

Animals in a zoo are more likely to live to an older age than those in the wild. In other words, the average life expectancy for animals in a zoo is generally greater than that of their wild counterpart. However, the maximum lifespan is the same for a given species, whether in the wild, or in a zoo. Maximum lifespan is the upper limit a given species can live. The maximum lifespan does not change simply because the animal is 'better off' in a zoo. Likewise, modern humans live far longer than their ancestors did on average, but the maximum possible lifespan for the human species has not changed throughout history. In other words, average human life expectancy increased but the maximum lifespan did not. Improving living conditions has not increased maximum human lifespan.

Over the course of the next several decades, average human life expectancy in the U.S. could increase to as much as 85 years. Ironically, however, it has recently been predicted that the generation born today may be the first in history to face an average life expectancy that is less than that of their parents. One in three children born today is likely to develop diabetes, and the rate of overweight/obesity continues to climb. If these trends are not reversed, the only way average life expectancy for this new generation could increase will be through major medical breakthroughs to 'cure' obesity, diabetes, or simply manage to keep people alive longer but with their existing disease.

The number of centenarians in the U.S., those reaching 100 years, is expected to grow from 140,000 to at least 600,000 within 40 years. How much longer could we actually expect to live? Claims have been made for individuals allegedly living well into their 140s. Myths still circulate about people who are reported to live to an extremely old age – up to 150 years. The problem with such claims is a lack of objective verification. Detailed scientific reports have refuted these claims. The official record for the longest-lived human, with verifiable documentation, is held by Jeanne Louise Calment. A French woman, Ms. Calment died in 1997 at the age of 122. Evidence suggests that throughout human history the maximum lifespan for humans has remained constant at around 120 years. A few ancient Romans may have live that long and certainly very few today have reached such an age. Even with recent increases in average lifespan, it does not appear that we have yet found a way to exceed that seeming constant. Does that mean that human lifespan, or the lifespan for any species, is fixed and not amenable to change?

The answer seems to be a resounding "no." The first evidence surfaced at Cornell University in 1935. What was probably little more than a laboratory curiosity for many years turns out to be a profound discovery into the quest for extension of lifespan. Laboratory rats were fed a diet with a significant calorie restriction – by as much as 40%! Such a significant dietary restriction would ordinarily be expected to induce malnutrition. However, the scientists ensured that the rats received an adequate amount of nutrients, vitamins and minerals. In essence, they were given what we might

call a mild starvation diet but without the malnutrition. What the scientists observed was nothing short of remarkable.

Instead of suffering with the kinds of diseases normally found in rats, or the functional decline and premature death associated with malnutrition, nearly the opposite was observed. Compared to the control group of rats, fed a 'normal' amount of calories, the calorie-restricted (but not nutrient restricted) group actually experienced fewer aging-related diseases. More startling to the researchers, the rats lived longer than the rats in the control group. In fact, they not only lived longer than the control group, they outlived the known maximum lifespan for their species! The experiment proved that maximum lifespan could be greatly extended. Several decades would pass before scientists could begin to explain this phenomenon.

The 1960s ushered in vigorous theories of the aging process, and over the past 40 years scientists have repeated this experiment of calorie restriction with adequate nutrition with more than 1,000 different species, with the same outcome each time. More than 2,000 articles in peer-reviewed journals have documented the significant effects of calorie restriction in animals. Some species have been observed to exceed their previously known maximum lifespan by as much as 50% or more. There is abundant evidence that a calorie restricted, but nutritionally rich, diet can extend average and maximum lifespans, and postpone the onset of most aging-related diseases.

Roy Walford, MD., was one of the leading researchers in the field of calorie restriction. He proposed that human lifespan could be extended significantly with what he called a CRON diet. CRON is an acronym for Calorie Restriction with Optimum Nutrition. Followers of his life extension research established the Calorie Restriction Society (CRS). The CRS offers guidance for those who wish to follow Dr. Walford's CRON diet.

How does calorie restriction work? It works by slowing the actual processes of aging; it reduces free radical damage, it diminishes insulin levels and the glycation of protein, it inhibits autoimmunity, and it stimulates expression of 'longevity' genes. These biological processes of aging will be described later. Is it possible for humans following a similar diet, restricting calories while avoiding malnutrition, to experience a lifespan surpassing the proposed current limit of 120 years? While the evidence from animal studies, so far, is compelling, it is hard to say just yet. One reason we don't yet have the answer is that humans live a great deal longer than mice and fruit flies; it will be a long time before we have a definitive answer.

In 2004, two articles published in the Journal of the American Medical Association offered tantalizing evidence that calorie restriction seems to have a positive impact on the occurrence of breast cancer and heart disease. Since then, many corroborating reports are finding their way into respected peer-reviewed journals. The evidence does not prove that maximum lifespan will increase with this approach, but the possibility seems likely. While there is no known fountain of youth, it just might be that a nutritionally balanced, calorie-restricted diet may be the next best thing.

The ABCs of Aging

What is aging? Simply stated it can be defined as a decline in ability, balance and/or capacity. I call it the ABCs of aging. Ability is the measure of physical and cognitive performance. Loss of ability leads to a loss of the functions of daily living and independence. You may no longer be able to climb stairs, and instead require an elevator. Getting up and down from a chair may become challenging, at best. Once enjoyable activities, such as golf or tennis, may become too painful or even impossible.

A loss of balance can develop at a number of levels in life. At the smallest level, the cellular level, we can experience imbalances in cellular function. If your doctor checks your blood and tells you that your potassium level is low, your hormones are out of balance, or that a liver enzyme is elevated, that represents a cellular imbalance. At the next level, the system level, we can experience imbalances as well. You may develop problems with your cardiovascular system, musculoskeletal system, or immune system for instance. It might become difficult to maintain your physical balance, literally, a frequent cause of falls and premature death in the elderly. At the highest level, we can experience imbalance in the dimensions of our being – physically, mentally and/or spiritually.

Finally, aging can result from a loss of capacity – reserve capacity. In the first few formative, developmental decades of life, we build reserves in all of our body systems to help us resist the slings and arrows of life, such as trauma and infections. Young children are prone to all sorts of infections until the immune system matures and develops the capacity to resist infections. Likewise, children frequently break bones until the musculoskeletal system matures. It is as though a fountain is in you. The fountain is a reservoir to hold something – immune capacity, muscle capacity, neurological capacity, bone density, hormone levels, and so on. When the reservoirs are full during our 20s and 30s, we feel invincible. We have reserve capacity and are more resilient to trauma and infections. If the reservoirs begin to dry up and lose reserves (capacity), as happens after another two or three decades, that is if we aren't proactive, we become susceptible once again to disease and injury, lacking resilience. Who is more likely to contract infections, break bones, and develop cancers? The young and the old do – when reserves and capacity are lower.

Health Span and Disability Span

Life is a continuum, from cradle to grave; each moment connected to the collective experiences of all preceding moments, and springing from choices we make. Biologically, this continuum can be distinguished by a gradual, often subtle, transition between two general timeframes, or spans of our life – growth and decline.

The first, growth, is the time when you develop and attain your functional maximum, biologically speaking. Physical capacity increases toward optimum. This is known as your health span. It is when you become physically independent, with the ability to carry out activities of daily living. Reserve capacity is greatest. Biological systems are in balance.

The body is always in a state of growth and decline. Initially, growth exceeds decline. In this regard, during the first few decades of life we all tend to age at a similar rate, in that each of us accumulates reserve capacity at a predictable rate. This is why pediatricians can refer to standardized growth charts and developmental milestones for well-child checkups. Young children will become ill many times per year. Why? Because their immune system is not fully matured. Every infectious organism that comes along stimulates an immune response. The next time the child is exposed to the same organism, he or she now has built-up immune system reserves to offer protection. By the time the child becomes a young adult he/she is far less susceptible to infections. In a similar fashion, young children frequently break bones because the skeletal system has not yet filled its bone density reserves. Life stressors of various sorts play an essential role in the processes of growth. All of our systems go through a similar process of the accumulation of reserves – endocrine, neurological, cognitive, emotional, cardiovascular, and so forth.

By the time early adulthood arrives, we often feel invincible. This feeling, in part, explains much of the risky behavior exhibited in teens and young adults. It seems that we can be up all night long but are good to go the next day. We endure the insults of vigorous activity and rough sports without fear of breaking a hip or damaging a muscle. We are less susceptible to infections than we were as a child, and when infections do occur in early adulthood, our body can more readily defeat them. We feel like we can handle anything on our plate. This is the time of life when reserve capacity is generally at its peak. Our biological armor is thick. Our body appears to tolerate the inordinate and unthinking abuse we put it through for the next few decades. The youthful sense of invincibility is a reflection of full reservoirs. Reserve capacity gives us resilience. It is youthful vitality.

At some point in life, reserve capacity begins a gradual decline, imperceptibly at first. We don't feel poorly and the doctor may tell us we are healthy. Test results remain 'normal.' The decline is subtle, making it easy to adapt unconsciously to changes that occur. By our late-thirties to early forties, unless we have been proactive, our health will become suboptimal, meaning that it is not what it once was but at the same time is has not yet declined to a point where true disease is detectable. The damaging processes underlying future, yet undiagnosed, conditions lurk beneath the surface. The armor that protected us is beginning to wear thin. By some estimates, as much as 80% of the adult population in the U.S. has suboptimal health.

Not everyone loses reserve capacity at the same rate or in a similar manner. It is at this point we begin aging at different rates from one another. A divergence occurs, causing some to age biologically and functionally at a more rapid rate than others, while others seem to age more slowly and gracefully. Some body systems may age or lose reserve capacity more rapidly than others. In fact, it is possible to begin aging biologically at a rate equivalent to someone 15-20 years older than your chronological age.

Why is it that we don't all age at a similar rate? Genetics certainly has something to do with it. However, as you will discover, pathological aging has far more to do with

environment and behavioral choices we make in life. Through unenlightened, unhealthy choices we can effectively age more rapidly, or function biologically like someone older than us, developing the largely avoidable pathologic diseases of aging – coronary heart disease, cancers, dementia, and metabolic dysfunction.

Even though we may be aging more rapidly than necessary, it is not always apparent since our physical tests might continue to fall in the 'normal' range when compared to others our age, and we still feel that we are capable of continuing our activities of daily living just as we have in the past. On the other hand, it may simply be that we are not tuned in to what our body is trying to tell us. As you will learn, the variance in the rate of decline in our body's reserve capacity has more to do with the choices we make in life than fate, genetics, or natural aging. Conventional medicine has done little more than pay lip service to this time in our life. Medical interventions begin only after making a diagnosis of disease. However, by this time the diseases of aging, pathological aging that is, have been developing for a long time, in many instances for decades. The central focus of medical intervention then becomes managing the symptoms. Modern medicine helps us to carry on, albeit at a much lower level of reserve capacity. This is the beginning of a transition to the next phase of our life – the disability span. In essence, we begin a downward course of silent degeneration.

Eventually everyone's functional capacity dwindles enough to give rise to signs and symptoms of disease. These 'diseases of aging' finally make us dependent – dependent on drugs, technology or support systems – in order to carry out our activities of daily living. We enter the second time span of our life – the disability span. It is a time associated with reduced levels of reserve capacity, resulting in diseases and morbidity. Conventional approaches to the diagnosed diseases of aging generally involve symptom management, most often with drugs. As far as symptom management goes, modern medicine has been remarkably successful in recent years. People live longer as a result, albeit with their disease and/or at a relatively low level of reserve capacity; with a diminished feeling of vitality. The average lifespan for Americans has increased in recent decades largely because modern medicine has found ways to keep people alive longer, but only after preventable diseases have developed, such as heart disease and cancer. The healthcare system has not been successful preventing disease. Furthermore, the medical establishment has been far less effective improving or replenishing reserves once they have declined. The health care system would be more aptly named the sick care system.

The ideal would be to maintain or even replenish functional reserves to an optimum level, extending our health span, and then at a much later point in life experience a more accelerated decline in morbidity, thus compressing or shortening the disability span of our life. If we happen extend the length of our life in the process, so much the better.

The focus of Living Younger is not longevity. It is primarily about maximizing your health expectancy and making the best of the years you have, however short or long. It is about living fully, with mindful intention. Finally, Living Younger is about celebrating

life and the experiences and wisdom that come with growing older. However, in the process of the personal transformation and improvement in health expectancy you will experience from Living Younger, you just might discover considerable years added to your life as well. Longevity might be thought of as the icing on the cake of living younger.

There is a distinction between natural aging and pathological aging. What most of us associate with growing old – heart disease, cancer, stroke, Alzheimer's disease, diabetes, loss of sexual function, etc. – is actually pathological aging. These diseases rarely occur naturally, and are not a common part of natural aging. It is not to say that we don't slow down or lose functionality in the normal aging process, or that these diseases never occur naturally. Rather, functionality just declines more slowly, and when we die of natural aging it is usually because everything finally gives out at about the same time. One of the notable observations about centenarians is that while they continue to grow older, they are aging more uniformly than others are. Interestingly, scientists observe that many of the pathological diseases of aging have a window of opportunity; after about 90 years the causes of death are more likely to result from frailty (e.g., falls leading to fractured hips, or infections like pneumonia and urinary tract infections) than from pathological diseases of aging (e.g., cancer, heart disease, Alzheimer's disease, etc.).

Biological Pathways to Aging

In the course of discussing aging and our opportunities to do something about aging, it is important to understand the fundamental biological mechanisms underlying the inevitable declines in ability, balance, and capacity. Let's address the most important theories for the pathways to biological aging.

The phenomenon known as aging is a result of pathological changes that are somewhat controllable through healthy lifestyle choices and existing technologies. Most of them share one thing in common – lifestyle and environment play a major role in their expression, development, and progression. Fortunately, that implies that they are also amenable to personal intervention. Here are some of the underlying manageable culprits involved in pathological aging.

- **Oxidative Stress**
  This theory contends that damage caused by free radicals contributes to aging and age-associated diseases. What is a free radical? Free radicals are molecules made unstable due to the loss of an electron. Oxygen is the most frequent molecule in the human body to become a free radical. We obtain oxygen from breathing.

  How do free radicals come about? They can occur in a variety of ways: smoking, high levels or prolonged periods of stress, sunshine, radiation exposure, over-exercising, etc. Most free radicals are produced within the body. Cells require energy in the form of adenosine triphosphate (ATP). ATP is manufactured in the mitochondria found in every cell in our body. Food is transformed in the

mitochondria to ATP. The process requires respiration to provide oxygen. In the process free radicals result. The more food we eat the more respiration is required and the more oxygen-species free radicals are produced. Eat less and make fewer free radicals. It has been estimated that as much as 90 percent of the free radicals in our body are the result of eating. Free radical scavengers, known as antioxidants, mop up the majority of free radicals, but it is easy to overwhelm them with too many free radicals. When the body cannot keep up scavenging free radicals, it is called oxidative stress.

What do free radicals do to us? Free radicals have been implicated in most aging-related diseases, including atherosclerosis, cancer, Alzheimer's disease, cataracts, osteoarthritis, and immune deficiency. The unstable molecule, because it is missing an electron, will attempt to replace the missing electron. It will scavenge an electron from other molecules around it, including mitochondrial and nuclear DNA, or the cell wall for example. In the process, free radicals damage the source of the donated electron. Moreover, the damaged molecule itself becomes a free radical in the process, causing a domino effect of damage until the free radical is quenched by an antioxidant or free radical scavenger.

The DNA in mitochondria is particularly susceptible to permanent damage, because, unlike nuclear DNA, mitochondrial DNA is incapable of repairing itself. Damaged mitochondria eventually lose their ability to provide energy to the remainder of the cell, in the form of ATP, further impairing us. The difference in life spans among mammals is largely a result of the ability to repair damaged DNA. The resulting destruction occurs in all tissues, including the endothelial wall of arteries, nerves in the brain, skin, etc. Free radical damage to the microcapillary circulation in the body results in circulatory deficits. Common associated problems include strokes, neuro-degeneration and macular degeneration. The result is heart disease, certain cancers, dementias, etc.

We can address the matter by first reducing the rate of formation of free radicals (eat less, reduce stress, stop smoking, avoid radiation, over-exercise, etc.). Second, we can try to mop up free radical after they have formed by ingesting adequate amounts of antioxidants in our diet and with antioxidant nutritional supplementation.

- **Chronic Inflammation**
  The study of inflammation has evolved rapidly in recent years, and the results have overturned much of what today's physicians learned in medical school about the origins of diseases as diverse as atherosclerosis, cancer, and Alzheimer's disease.

  The literal definition of inflammation is to "set on fire." Inflammation has long been recognized as the body's principal line of defense against infection, causing a constellation of local and systemic signs and symptoms: redness, heat, swelling, and pain. It is the life-saving component of your immune system that

helps fend off bacteria, viruses, fungi, and other microbial invaders. It also helps damaged tissue repair itself from injury. Without inflammation, we would be sitting ducks in a very hostile world, with no way to repair the damage constantly being inflicted on us.

Acute Inflammation

Acute inflammation is the body's initial response to injury, illness, infections, and stress. When you cut yourself with a paring knife, you want:

- To stop bleeding
    - By constricting blood vessels
    - By increasing fibrinogen and clotting factors
- White blood cells to fight infection
- Pain to remind you not to play with knives

Acute inflammation is essential to our survival, and when the inciting event has been resolved, we want acute inflammation to resolve.

Excess Inflammation

Excess inflammation on the other hand, is an over expression of the inflammatory response. Excessive inflammation causes or contributes to asthma, rheumatoid arthritis, systemic lupus erythematosis (SLE), and allergic diseases. Furthermore, patients with diseases like SLE, characterized by systemic vascular inflammation, tend to develop arteriosclerosis at a younger age and more severely than people without these disorders. Low-level or healed arteritis may hasten the development of atherosclerosis or push existing lesions to growth or complications. A clue to the link between inflammation and heart disease comes from the observation that people with chronic inflammatory diseases have earlier and more severe atherosclerosis.

Mediators of Inflammation

Inflammation is mediated by a class of hormone-like substances known as eicosanoids. Eicosanoids are local hormones and do not circulate through the bloodstream. Every cell in the human body produces eicosanoids. They number it least in the hundreds. Eicosanoids control nearly everything from inflammatory processes and immune function, to the brain and heart.

Eicosanoids allow specialized inflammation cells (neutrophils and macrophages) to mobilize and squeeze between the linings of blood vessels. Mast cells, at the first sign of a foreign invader, release the chemical histamine, which signals the immune system that it should launch an attack. Histamine circulates through your bloodstream and attaches onto certain cells, causing a cascade of reactions to occur, starting with a burst of pro-inflammatory eicosanoids. Blood vessels dilate in response to these eicosanoids, allowing more immune cells (neutrophils and macrophages) to reach their target as quickly as possible. This dilation of blood vessels, mediated by eicosanoids, causes the trademark signs of inflammation: swelling, heat, redness, and pain.

There are two general categories of eicosanoids, those that promote inflammation (pro-inflammatory) and tissue destruction and those that stop inflammation (anti-inflammatory) and promote healing. Pro-inflammatory eicosanoids are frequently referred to as "bad" and anti-inflammatory eicosanoids are referred to as "good." You need to have both kinds in the proper balance in order to be in a state of wellness. Unfortunately, most of us produce too many pro-inflammatory eicosanoids, which leads to increasing levels of silent inflammation and eventually to chronic disease.

How Inflammatory Mediators are Made

The body makes eicosanoids directly or indirectly from omega-3 and omega-6 essential fatty acids. The body cannot synthesize omega-6 and omega-3 fatty acids, so they must be supplied by the diet. Rich sources of omega-6 include processed vegetable oils (e.g., corn and safflower oils), dairy products and red meat. Omega-3 is most prevalent in cold marine fish, and found to a lesser degree in walnuts and almonds. The amount of omega-3 from fish oil in the American diet has been steadily decreasing over the past century. It is estimated that our consumption of EPA and DHA is only 5 percent of what it was 100 years ago. During the same time period we have had a dramatic dietary increase in pro-inflammatory omega-6 fats coming from vegetable oils. Until about 80 years ago, our population ate a 2:1 ratio of omega-6 to omega-3 fats. Now, the ratio of these two groups of fatty acids is closer to 20:1 in the typical American.

The first step in the production of eicosanoids begins in a cell, with the release of a fatty acid (AA, DGLA, and EPA) from the phospholipids in the cell membrane. The enzyme responsible for the release of the fatty acid is phospholipase A_2. Depending on which fatty acid is released, you will either make “good” eicosanoids (from DGLA), or “bad” eicosanoids (from AA), or neutral eicosanoids (from EPA).

Anti-Inflammatory Eicosanoids

Anti-inflammatory eicosanoids result from a diet that is both rich in long-chain omega-3 fatty acids and sparse in omega-6 fatty acids, particularly arachidonic acid. For example, alpha linolenic acid is an omega-3 fatty acid found in flaxseed oil. Several enzymatic steps convert it into EPA. Unfortunately, alpha linolenic acid inhibits delta-6 desaturase, an enzyme that converts alpha linolenic acid into EPA, making the process rather inefficient. Delta-6 desaturase can be further blocked by deficiencies in the diet, including magnesium, zinc, and vitamin B6. Diets high in fatty acids and cholesterol as well as alcohol, viral infections and even aging block the conversion. At best, approximately 15% of the alpha linolenic acid in flaxseed oil can be converted into EPA. Approximately 5% is converted into DHA, another important omega-3 fatty acid. EPA is further metabolized through the cyclooxygenase and the lipoxygenase pathways into anti-inflammatory prostaglandins and leukotrienes.

Pro-Inflammatory Eicosanoids
Pro-inflammatory eicosanoids result primarily from a diet rich in Omega-6 fatty acids such as arachidonic acid, and sparse in Omega-3 fatty acids. Omega-6 fatty acids are essential for us to mount an inflammatory response.

Linoleic acid is an omega-6 fatty acid commonly found in corn, safflower, sunflower etc. Through the enzyme process involving delta-6-desaturase, linoleic acid is converted to gamma-linolenic acid (GLA), also found naturally in soy, borage oil, blackcurrant seed and evening Primrose oil. Here again, delta-6 desaturase can be inhibited by viral infections, dietary deficiencies of magnesium, zinc, vitamin B6, as well as diets high in trans- and saturated fats, and alcohol and the process of aging.

How do these immunological agents cause pain? Pro-inflammatory eicosanoids make it easier for immune cells to pass through blood vessel walls to reach the source of injury or microbe invasion. The same eicosanoids also trigger increased vascular permeability, resulting in an accumulation of excess fluid in the area. This causes blood vessels to swell even more, which touches off nerve endings, sending a message to our brain that you're in pain. Due to the increased blood flow, redness and heat occur. Additionally, eicosanoids increase the sensitivity of the nerve fibers so they send out an even stronger pain signal. (In silent inflammation, the output of pro-inflammatory eicosanoids is below the threshold of pain perception.) After the battle has been won, your body normally recalls the immune system army. It does this by sending out anti-inflammatory eicosanoids.

Eicosanoid Classes
The classes of eicosanoids are shown below:

- Prostaglandins are involved with fever, inflammation, and pain. Prostaglandins govern cellular responses, immune function, and hormone synthesis.
- Thromboxanes increase blood viscosity, platelet aggregation and clot formation. Thromboxanes also regulate blood vessel tone, e.g., they produce vasoconstriction.
- Leukotrienes. Leukotrienes regulate various reactions; such is allergic reactions and inflammatory responses.
- Lipoxins
- Aspirin-triggered epi-lipoxins
- Hydroxylated fatty acids
- Isoprostanoids
- Epoxyeicosatrienoic acids
- Endocannabinoids

A number of cytokines can be particularly dangerous when overproduced:

- NF-*k*B
- TNF-alpha

- IL-6
- IL-1(b)
- IL-8

Inflammation, then, is your principal and most primitive line of defense against infections and injury. It helps repair damaged tissue. Without inflammation, we would be sitting ducks in a hostile world! So, why is it causing some of the deadliest diseases of the 21st century?

When Inflammation Persists

You probably think of wellness as simply the absence of chronic disease. If you are not sick, then you must be well. That definition simply is inadequate because it can take years, if not decades, for diseases like heart disease, diabetes, cancer, and Alzheimer's to finally emerge. Having increased levels of silent inflammation means you are not in a state of wellness

Silent inflammation is simply inflammation that falls below the threshold of perceived pain. Ironically, while inflammation is the life-saving component of your immune system that helps fend infections and helps damaged tissue repair itself from injury, it also has a dark side if it is not turned off. Sometimes the whole complex process doesn't shut down. Instead, it persists and transforms into chronic silent inflammation. There is a breakdown in communication so that pro-inflammatory eicosanoids continue to be generated, though at a lower level. This constant generation of silent inflammation may be due to a genetic predisposition or a lifestyle factor like obesity, poor diet, or smoking. Healthy tissues, cells, and blood vessels come under continuing attack.

Silent inflammation, also known as chronic low-grade inflammation, can smolder silently within your body for decades without causing any obvious outward problems. It can activate potentially harmful genes. Overall, it erodes your health and takes years from your life. Nearly 80% of the costs for an average HMO go to pay for disease conditions strongly associated with silent inflammation.

Study after study points to myriad ways in which chronic inflammation does great harm to the body. Its damaging effects on arteries can destabilize cholesterol deposits, which can lead to heart attacks and strokes. Some cancers, notably those of the colon, lung and liver, often begin at a site of long-standing inflammation. It can trigger rapid cell division, causing healthy cells to turn into cancerous ones. Depressing the immune system is another way silent inflammation promotes the formation of cancerous tumors. In addition, it attacks nerve cells in the brains of those predisposed to Alzheimer's disease. Recently, inflammation has also been associated with obesity, diabetes, and metabolic syndrome.

Silent inflammation is responsible for:

- Arterial damage.
- Destabilized cholesterol deposits.
- Destruction of nerve cells in the brain.
- Depression of the immune system.
- Promotion of cancers.
- Activation of potentially harmful genes

The Evolution of Silent Inflammation

Our Paleolithic ancestors lived a very active lifestyle, consumed high protein diets consisting of wild game and fish, and whole foods such as fruits, vegetables, nuts and seeds. They were exposed to significant trauma and infections. The threats they faced were "really dangerous"; imagine being chased by a saber toothed tiger! Because of the successes from public health measures such as sanitation and immunizations, Americans face far fewer infections and trauma than did our ancestors. Today our threats are more perceived than real; the pressure of preparing for a board room presentation, getting the kids to soccer practice on time, et cetera. In contrast to our early ancestors, the average American leads a comparatively sedentary lifestyle. Our diets have changed dramatically, including a significant excess of carbohydrates. The same is true of our ability to generate a strong inflammatory response. This was previously the only way to survive microbial or parasitic invasions. Those with overactive immune systems had a better chance of survival than those with weaker immune defenses. Thus, we've inherited a genetic predisposition for an intense inflammatory response.

While our DNA has changed very little from that of our Paleolithic ancestors (less than 1/2%), we have dramatically changed our environment and the conditions in which we live today.

Many factors, which helped our Paleolithic ancestors survived, may be working against us today. For example:

- In the past, insulin resistance may have been a survival advantage by helping store fat and survive during famines. Today famine is almost nonexistent in this country, but rather we have too much to eat. With no shortage of food and a very high percentage of it comprised of high glycemic carbohydrates, insulin resistance is no longer an advantage but rather a distinct disadvantage to our survival.
- Thyroid resistance may have been another survival development for our early ancestors. During times of stress illness or famine. It may have been advantageous to convert the thyroid hormone T4 into reverse T3, which is an inactive form of another thyroid hormone T3. The end result is a reduction in metabolism, conserving energy and calories. Today the purpose for thyroid resistance seems nonexistent.
- Anti-inflammation resistance may have helped our ancestors survive acute infectious diseases and trauma. In other words, it would have been

advantageous to have a hyper-responsive inflammatory system. With far fewer causes for inflammation today, having an inflammatory system which responds easily works against us.

What helped our Paleolithic ancestors make it to reproductive age is killing us now!

Another clue to the link between inflammation and disease came from the observation that people with chronic diseases of excess of inflammation have earlier and more severe arterial sclerosis. Examples of conditions resulting from excess inflammation include asthma, rheumatoid arthritis, systemic lupus erythematosis, and various allergic diseases.

How to Start the Fire

- Choose the wrong parents! Genetic variations create tendencies to develop certain inflammatory conditions, such as rheumatoid arthritis. Genetic tendencies increase the odds that a disease will develop. However, expression of genetic variants most often requires certain triggers – behaviors or environmental influences for expression over years or decades.
- Smoking and other environmental toxins promote inflammation and oxidative stress
- Responding to events in our life with stress raises cortisol levels
- Hormones are the primary system for controlling cellular functions, turning cell functions and genetic expression on and off. Allowing hormones to decline may Upregulate production of pro-inflammatory eicosanoids
- chronic infections, such as periodontal disease and chronic peptic ulcers, promote chronic systemic silent inflammation
- Inactivity creates a vicious cycle of promoting inflammation, which promotes loss of muscle strength and mass
- The food we eat is the most important source of silent inflammation for most of us, upsetting the balance of hormones
- Free radicals and oxidative stress
- Glycation
- Aging

Sadly, misinformation contributes to the prevalence of silent inflammation. For example, the Ontario cattlemen's Association hosts a children's educational resource website. The website includes a cartoon drawing of a hamburger, pointing out that the wilted lettuce, pale tomato and pickles comprise the fruits and vegetables in a diet. The processed cheese is a source of dairy products enriched flour used to make the bond provides grains and cereals, and the fatty hamburger is a source of meat and protein. The very purpose of this website page is to convince young consumers that a hamburger is not a high-fat junk food item

The Basis of Silent Inflammation
Silent inflammation is the first sign that your body is out of balance and you are no longer well. Silent inflammation is linked to three underlying hormonal changes. The overproduction of three distinct types of hormones set the stage for chronic disease.

- Pro-inflammatory eicosanoids
- Insulin
- Cortisol

Excess Insulin Causes Silent Inflammation
Why do we have this growing epidemic of silent inflammation? Simply because evolution tends to favor those biological characteristics. Our early ancestors needed to develop the genetic propensity for producing large amounts of insulin whenever they ate excess calories during the times of feasting. Our genes evolved to increase insulin in two ways: eating too many carbohydrates or eating too many calories.

In general, the more excess body fat you have, the more insulin resistance you have, and the more insulin your body needs to produce in order to overcome this resistance. This excess insulin also increases the storage of body fat. Obesity is one of the biggest generators of silent inflammation. Our diabetes epidemic has grown by 33 percent in the last decade. Excess insulin makes you fat and keeps you fat. This smoking gun links excess fat to a wide range of chronic diseases such as heart disease, type 2 diabetes, cancer, and Alzheimer's.

Anti-Inflammatory Drugs and Inflammation
Anti-inflammatory drugs stop the overproduction of pro-inflammatory eicosanoids. Unfortunately, they also stop production of anti-inflammatory eicosanoids, which your body needs not only to repair the damage on the battlefield, but also to maintain a state of wellness. Long-term use of these medications can cause a host of side effects, from stomach ulcers to a digestive lining malfunction called leaky gut syndrome to heart failure or even death. In fact, nearly as many people in America die each year from the recommended use of anti-inflammatory drugs as die from AIDS.

Obesity and Inflammation
We now have an obesity epidemic on our hands and that means a corresponding epidemic of inflammation. The very genes that saved us tens of thousands of years ago are now our biggest liability. Up until 1980, the rates of obesity in America remained fairly constant, at about 14% of the population. During the past 25 years, however, obesity surged to a current record-setting 33% of Americans. The reason is that we are eating more calories because we are hungrier. The more calories you eat, the hungrier you become. And what really makes you hungry is low blood sugar. The brain needs a certain amount of glucose to fuel itself, using 70% of your blood glucose to keep itself functioning, though it accounts for less than 3% of your total body weight. When blood

glucose levels fall, your brain may feel irritated or in a mental fog or may feel increased hunger. You learn to self-medicate this drop in blood glucose levels by eating more carbohydrates, especially high-glycemic carbohydrates that quickly enter the bloodstream as glucose.

In contrast to what many physicians learned in medical school, fat cells are not a metabolically inert lipid droplet. The fat cell is a factory of proinflammatory mediators that recruits leukocytes. Fat is a highly active endocrine gland secreting more than 100 proteins, fatty acids, hormones and inflammatory agents. In other words, fat cells generate silent inflammation. The bottom line; the fatter you are, the more inflammation you are generating around the clock. This is what links obesity with increased risk of heart disease, cancer, or Alzheimer's disease.

The recent understanding that obesity is an inflammatory condition may explain why many diets are ineffective to help people lose weight because they fail to deal with the underlying silent inflammation. The facts are:

- Higher BMI is associated with higher CRP levels.
- The obese have low-grade systemic inflammation.
    - Elevated levels of IL-6, TNF-alpha and fibrinogen.
- Obesity results in diminished growth hormone levels.

Unless your weight loss diet simultaneously addresses silent inflammation, it may be difficult if not impossible to lose body fat.

Inactivity and Inflammation

Cardiorespiratory fitness is inversely associated with CRP levels, a marker of inflammation. Strength and muscle mass are inversely associated with levels of the pro-inflammatory cytokines IL-6, TNF-alpha, and NF-kB. This explains in part why exercise can reduce joint pain in patients with inflammatory diseases such as arthritis, because exercise reduces inflammation. Inactivity and inflammation creates a vicious cycle. In other words, high cytokine levels may contribute to the loss of muscle mass and strength that accompanies aging.

Stress and Inflammation

Cortisol is the link between stress and inflammation. While cortisol is intended to be a net anti-inflammatory hormone, when produce to chronically elevated levels, cortisol accelerates inflammation by increasing insulin levels, body fat, and by reducing lean body mass.

Research shows that negative emotions and stressful experiences can stimulate pro-inflammatory cytokines. Furthermore, depression has been strongly associated with elevated CRP levels, tumor necrosis factor alpha levels, cancer, and heart disease. Healthy adults who have mild to moderate symptoms of depression, anger, or even hostility may have levels of CRP two to three times higher than those of their calmer counterparts. And the more negative their moods, the higher their CRP levels are likely to be.

Sleep Deprivation and Inflammation
We are a sleep deprived nation. Sleep deprivation is associated with increased levels of inflammatory cytokines:

- IL-6 by 40-60%
- TNF-alpha by 20-30%

Pain flare-ups occur in response to lack of sleep, in a variety of disorders

Hormones and Inflammation
The neuroendocrine theory of aging states: we age because our hormones decline, rather than our hormones declining because we age. It may help to think of your hormones as a wireless Internet system regulating cell function and genetic expression. The neuroendocrine theory argues that diseases are more likely to occur when hormones are not optimally balanced and at maximum reserves. Our hormones reach maximum levels and functionality in our early 20s and remain at high levels until our early 30s, at which time they begin a slow steady decline. As they decline, and the body develops resistance to hormones, cell and system function lose equilibrium. This is when inflammatory-related diseases begin to emerge. Low hormone levels or hormone resistance may have any of the following results:

- Low Estrogen.
    - Increases expression of IL-6, TNF-alpha, and IL-1(b)
    - Results in increased blood lipids
- Low Testosterone.
    - Increases CRP levels, TNF-alpha, IL-6
    - TNF-alpha decreases nitric oxide production and promotes catabolism.
    - Reduces nitric oxide production.
- Low Thyroid.
    - Low total and free thyroid levels are correlated with metabolic syndrome, and elevated CRP levels.
- Low Growth Hormone
    - Correlates with increased homocysteine levels
    - Results in increased adipose tissue
    - Contributes to endothelial dysfunction.
    - Correlates with premature cardiac deaths.

The Impact of Silent Inflammation
Diseases related to chronic inflammation:

Disease	Mechanism
Allergy	inflammatory cytokines induce autoimmune reactions
Alzheimer's	chronic inflammation destroys brain cells
Anemia	inflammatory cytokines attack erythropoietin production
Aortic valve stenosis	Chronic inflammation damages heart valves
Arthritis	inflammatory cytokines destroy joint cartilage and synovial fluid

- Cancer — chronic inflammation causes many cancers
- CHF — chronic inflammation contributes to heart muscle wasting
- Fibromyalgia — inflammatory cytokines are elevated
- Fibrosis — inflammatory cytokines attack traumatized tissue
- Heart attack — chronic inflammation contributes to coronary atherosclerosis
- Kidney failure — inflammatory cytokines restrict circulation and damage nephrons
- Lupus — inflammatory cytokines induce an autoimmune attack
- Pancreatitis — inflammatory cytokines induce pancreatic cell injury
- Psoriasis — inflammatory cytokines induce dermatitis
- Stroke events — chronic inflammation promotes thromboembolic

Inflammation and Atherosclerosis

If we could eliminate heart disease tomorrow, the average life expectancy of every American would increase by an estimated 10 years. Although mortality from heart disease has decreased due to medical advances, the incidence of heart disease is on the rise. More of us are getting heart disease because we aren't doing enough to address the underlying cause: inflammation in the arteries.

Up to half of all events associated with cardiovascular disease are reported to occur in apparently healthy individuals who have few or none of the traditional risk factors, including dyslipidemia. Fifty-percent of all heart attacks occur in people with normal cholesterol levels, and the best drug that reduces heart attacks (aspirin) doesn't have any effect on cholesterol levels. What's more, the most dangerous cholesterol deposits often aren't that large, but they are very prone to rupture. These are known as soft plaques.

Several things can cause stoppage of oxygen to the heart. A rupture could occur in a section of unstable plaque lining the artery wall. This causes the activation of platelets, which clump together and block blood flow. You could have a spasm in the artery that blocks blood flow to the heart. More often, it may be due to an electrical flutter, which disrupts the synchronized beating and causes the heart to stop functioning altogether. None of these heart attack causes has much to do with increased cholesterol levels, but they have everything to do with silent inflammation.

The role of inflammation in plaque rupture explains why the most vulnerable plaques are often so small that they can't be detected by conventional technology like an angiogram, and why an MI occurs after bypass surgery or stenting has resorted patency at a critically stenosed site. Inflammation is systemic, and fixing the plumbing at one site does nothing to prevent destabilization of inflammatory plaques in another. Further, some evidence

suggests that interventions such as balloon angioplasty and stent placement may actually worsen local inflammation, hence the difficult problem of reocclusion at these sites.

Pro-inflammatory eicosanoids are also the culprits behind vasospasm, the second cause of fatal heart attacks. Pro-inflammatory eicosanoids act as powerful constrictors of your arteries and can lead to a vasospasm. Finally, lack of sufficient levels of omega-3 fatty acids in the heart muscle can also lead to a fatal heart attack caused by chaotic electric rhythms in the heart. This condition, called sudden death, accounts for more than 50% of all fatal heart attacks.

CRP and Heart Disease

In addition to being a marker of vascular inflammation, C-Reactive Protein (CRP) also plays an active role in atherogenesis. It is detectable in the early stages of plaque development and is believed to be involved throughout the atherogenic process, facilitating everything from the initial recruitment of leukocytes to the arterial wall to the eventual rupture of the plaque.

A number of large, prospective epidemiologic studies indicate hs-CRP as a strong independent predictor of future cardiovascular events, including myocardial infarction, ischemic stroke, peripheral vascular disease, and sudden cardiac death among individuals without known cardiovascular disease. Subjects in the top quartile of hs-CRP levels have a 2-3 times greater relative risk of a future coronary event than do those in the bottom quartile. Women with the highest baseline hs-CRP levels have 5 times greater risk of suffering a vascular event and 7 times the risk of myocardial infarction or stroke. In patients with established coronary heart disease (CHD), hs-CRP has been shown to be a strong predictor of future cardiovascular risk, with or without a previous myocardial infarction.

Men with high levels of both hs-CRP and total cholesterol had a 5.3 times greater relative risk of a future myocardial infarction then did men with either high total cholesterol or high hs-CRP levels alone. Women with high hs-CRP and low LDL-C levels have a higher absolute risk of a future CVD event than women with low hs-CRP and high LDL-C levels, despite the fact that high LDL-C is traditionally targeted for aggressive intervention in primary prevention.
Similar risk increases noted for stroke in women with a 150% increase risk for stroke in men. Risk for developing diabetes increases 400% with elevated CRP and 300% for Alzheimer's disease. Even macular degeneration risk is doubled with elevated CRP. Elevated CRP levels predict subclinical arterial sclerosis in children.

In January 2003, joint guidelines from the Centers for Disease Control and Prevention (CDC) and the American Heart Association (AHA) named hs-CRP as the inflammatory marker of choice to assess cardiovascular risk.

Hs-CRP has also been shown to be a predictor of thromboembolic stroke in middle-aged, healthy men. There is an almost fourfold difference in risk among men in the highest hs-CRP quartile versus hose in the lowest quartile. The risk of stroke increased significantly with higher hs-CRP levels in middle-aged men, men without a history of hypertension or diabetes, and in nonsmokers.

Elevated hs-CRP levels are an independent risk factor for age-associated macular degeneration (AMD), implicating the role of inflammation in the pathogenesis of AMD

Inflammation and Diabetes

Currently, about 7% of adult Americans have type-2 diabetes. Overall, this condition now costs our country $132 billion a year. It is now estimated that 33% of the children born after 2000 will develop type 2 diabetes at some point in their lives.

Excess glucose in the blood produces free radicals. Furthermore, excess glucose is neurotoxic to the brain. Diabetes increases the risk of dying from heart disease by two to four times. Moreover, it increases the risk of kidney failure, blindness, impotence, and amputation.

Inflammation and Cancer

Inflammation promotes several different cancers, including colon and lung. Macrophages and other inflammatory cells fire out free radicals, which destroy not only microbes but also the DNA from healthy cells. This can lead to genetic mutations that cause a cell to rapidly grow and proliferate. It is known that pro-inflammatory eicosanoids are not only highly associated with tumor formation, but also facilitate its spread into surrounding tissues (metastasis).

Chronic inflammatory bowel disease increases risk for colon cancer. Elevated CRP levels have been associated with increased risk for colorectal cancer. Low intake of omega-3 fatty acids in the diet correlates with a two to three fold greater prostate cancer frequency.

NSAID users have fewer cancers, including breast, colon and prostate. Reductions of breast and colon cancer have been noted to be as great as 20 to 40%. Aspirin use is associated with decreased estrogen receptor positive cancers by as much as 20%. NSAID use appears to decrease intracellular estrogen production

Studies have shown that people who take daily doses of aspirin, known to block the COX-2 enzyme, are less likely to develop precancerous growths in the colon called polyps. In colon, breast, ovarian and many other cancers, the more anti-inflammatory drugs you take, the lower your incidence of cancer. Those who take aspirin regularly have less than half the rate of the most common type of lung cancer. Researchers have also known for years that giving animals high

levels of pro-inflammatory omega-6 fatty acids increases their cancer death rates when they had tumor cells implanted in their bodies. On the other hand, when these animals were given fish oil supplementation (anti-inflammatory omega-3 fatty acids), their implanted tumors dramatically decreased in size, and the animals experienced longer life spans.

Alzheimer's Disease

The greatest fear of people over the age of 50 is losing their mind. Neurodegenerative diseases such as Alzheimer's disease and Parkinson's disease are on the rise, as is the associated mortality rate. Alzheimer's disease accounts for more than 70% of all dementias. An estimated 3-5% of Americans will develop Alzheimer's disease by age 65, and by age 85, nearly 50% will have it. Alzheimer's disease results from the development of amyloid plaques in the brain. However, it is also an inflammatory condition.

Systemic inflammation affects the brain. Brains of Alzheimer's patients have elevated interleukin-6, IL-1 beta, TNF-alpha, and arachidonic acid levels. They are also noted to have decreased DHA levels and lower omega-3 to omega-6 ratios. Elevated CRP levels have been found to predict dementia is much is 25 years later. IL-6 levels can predict cognitive decline.

Patients who are already taking anti-inflammatory drugs for arthritis or other conditions are less likely to develop the disease than whose who were not. A Johns Hopkins study found that individuals who took NSAIDs for at least two years had a 60% decrease in Alzheimer's risk. Just the use of aspirin resulted in a 26% reduction, and other NSAIDs caused a further reduction. People over 85 who eat the highest amount of fish have a 40% lesser risk of developing Alzheimer's than non-fish eaters. The Framingham Heart Study found that those who had the lowest levels of long-chain omega-3 fatty acids in their blood had a 67% greater likelihood of developing Alzheimer's disease. Individuals who consume the most pro-inflammatory omega-6 fatty acids have a 250% increase in the development of Alzheimer's. Middle-aged men who have a high hs-CRP level are at a 300% increased risk of developing Alzheimer's 25 years later. Another factor for preventing Alzheimer's disease is insulin control. It has been show that neurons that display insulin resistance are potent stimulators of amyloid plaque production.

Anything that reduces silent inflammation by reducing pro-inflammatory eicosanoids (like aspirin or eating fish) seems to reduce your risk of Alzheimer's disease. The catch is you have to take these measures to reduce silent inflammation decades before Alzheimer's starts.

Autoimmune Diseases

These diseases, which include rheumatoid arthritis, multiple sclerosis, and lupus, are the most clear-cut examples of out-of-control inflammation. In multiple sclerosis (MS), the insulating membrane that coats nerve cells unravels due to

ongoing inflammation. MS is characterized by an overproduction of pro-inflammatory eicosanoids. MS patients have low levels of DHA in their brains. This may explain why populations that consume the most fish have the lowest rates of MS.

- **Glycation**
  It is well known that diabetics age prematurely, but even non-diabetics suffer from a devastating chemical reaction called glycation. Protein, besides being a source of energy, is the building block for every tissue and organ in your body. Protein has interesting characteristics that make it useful and important as a building block. Protein molecules have enormous capacity to be bent in a variety of configurations. In its natural state protein tends to be both stretchy and slippery. Imagine a raw egg white or a raw oyster. Both are essentially protein in a natural form; they are slippery and stretchy. These are both desirable traits for tissue and organs. We want muscles to stretch, and tendons to glide without friction. Healthy arteries should expand when blood is pumped through them. When protein becomes stiff and sticky it hinders body functions.

  To get an idea of what glycation does inside your body imagine what happens when you bake a ham. First, you might coat the ham with honey or brown sugar. Then you bake it in the oven. Remember what the outer surface of the ham is like when you slice into it after it has finished baking? The surface has suddenly changed; it is thick and tough. Why? The ham is protein, for the most part. You coated it with sugar (glucose) and then baked it. The sugar molecules interacted with the protein bonds to form nonfunctioning structures called advanced glycation end products (AGEs). AGEs form in your body when the protein that makes up the tissues in the body are exposed to chronically high quantities of sugar and refined carbohydrates, such as is found in the typical American diet. Cooking foods at high temperatures results in a “browning” effect, where sugars and certain oxidized fats react with proteins to form AGEs in the food.

  The proteins that make up every tissue and organ in your body are susceptible to glycation. Aging can be regarded as a slow cooking process, since these AGEs form throughout our body – the brain, cardiovascular system, kidneys, and skin, cartilage, eye lenses, everywhere – and they damage the tissues. The same change that occurs to the protein bonds on the surface of the baked ham also happens to the proteins that make up your arteries – they lose the ability to expand when blood is being pumped through them. The glycation process is presently irreversible.

  Diabetics face chronic elevations of sugar in their blood. AGEs form at an accelerated rate in diabetics. Blood sugar control is assessed in diabetics by performing a test called HgbA1c. It is a measure of the amount of glycation that has occurred in the hemoglobin of red blood cells. The greater the HgbA1c the poorer the blood sugar control, and the more glycation damage that is happening. Glycation that occurs in the red blood cell also occurs in all other

tissue as well. AGEs play a role in the development of stiffening of arteries and senile dementia. Additionally, cholesterol-carrying proteins that have been glycosylated do not bind to receptors on liver cells that halt the manufacture of cholesterol. As a result, too much cholesterol is manufactured.

Excessive glycation promotes the formation of free radicals and is partly responsible for a chronic, low-grade state of inflammation. It has many adverse effects: inactivation of enzymes, damage to structural and regulatory proteins, impaired immune function, and increased likelihood of autoimmune diseases. You could say that glycation creates a triple whammy for aging.

- **Telomere-Shortening and DNA Damage/Mutation**
  DNA is the code of life. It is the template not only for life, but what makes each one of us unique. DNA must be able to replicate itself reliably in order for life to carry on. Each time a cell replicates, a small piece of DNA is taken off the end of each chromosome. Aging cells lose their DNA gene repair mechanisms and the result is that DNA genetic damage can cause cells to proliferate out of control, i.e., turn into cancer cells.

  Nature allows for some losses during replication by giving the ends of the DNA strand non-functioning sequences of code. Telomeres are the end-cap segments of DNA. It is these nonfunctioning ends that are lost in the process of replication, a little at a time. The shorter the telomere gets, the more it affects the way the cell expresses its genetic code. The result is cellular aging. Eventually, however, too much of the telomere is lost and the DNA can no longer accurately replicate. When it is unable to replicate the cell dies.

  In addition to serving as a clock for aging, the telomere is involved in: protecting the end of the chromosome from damage; allowing for more complete replication of the chromosome; controlling gene expression; and aiding in the organization of the chromosome. When it is no longer able to replicate accurately, so that errors occur, we call it a mutation. When cellular DNA mutates cancer cells can form. In other words, the telomere determines not only the aging of the cell, but for the risk of cancer, Alzheimer's disease, and other degenerative diseases.

  Natural and synthetic compounds can mutate cellular DNA. Free radicals can damage DNA. Stress has been demonstrated to accelerate the shortening of telomeres. A study evaluated the DNA of women who perceived their stress levels to be very high, and found that the telomeres had been shortened more in the chronically stressed women than the DNA in women with low levels of perceived stress. In fact, the DNA in the high stress women looked as much as 10- 15 years older.

- **Hormone Imbalance**
  The Neuroendocrine Theory states that we age because our hormones decline, rather than the reverse assumption that our hormones decline because we age.

Most aging-related diseases have at their basis some hormone dysfunction – imbalances, insufficient levels, or hormone resistance. Some of these disorders include coronary heart disease, osteoporosis, cancer, dementia, diabetes.

The nervous system is analogous to the electrical wiring in your home. Every light in your home has a switch to turn the light on and off. The switch is hard-wired to the light. Nerves transmit signals to and from cells and organs via electrical impulses. Nerve signals can turn organ and cell functions on and off, like a light bulb.

Another, more pervasive, means used by our body to communicate is with hormones. The trillions of cells in the human body are delicately synchronized to function by chemical signals called hormones. Based on feedback systems they, too, turn cell functions on and off. We make literally hundreds of different hormones, not just sex hormones like estrogen and testosterone. Hormones circulate in the body waiting for a signal to turn a cell function on or off; to modify or stimulate a chemical process; to trigger or inhibit gene expression. Hormones are everywhere; they are inside and outside every one of the cells in your body. As we age, however, most of our hormone levels begin to decline. A few of them increase, like insulin and the stress hormone cortisol.

The balance, or ratio, of many hormones undergoes change. Optimum health is dependent on specific ratios of many hormones. Some hormones have opposing functions and equilibrium is essential to maintain normal health. An example is the essential balance between estrogen and progesterone, or insulin and glucagon. Think of them as yin and yang. Food, activity levels, stress, environmental factors, and many drugs can alter the balance and effectiveness of hormones. Furthermore, some cells become resistant to hormones. The best known hormone resistance is that of insulin resistance, found in diabetics. Cells may become resistant to other hormones as well.

Moreover, the relationships, or ratios, between hormones can become imbalanced. Aging creates a severe hormone imbalance that is often a contributing cause to many diseases associated with aging. The result is a failure of cell-to-cell or system communication. The ability of cells to function and perform their roles, in their intended ways, declines and deteriorates because of failures in hormonally mediated communication, leading to depression, osteoporosis, coronary artery disease and loss of libido.

- **Excitotoxicity**
  Excitotoxicity is another related mechanism of aging. Neurotransmitters (hormones) are crucial to brain function and are the essential means by which nerves communicate. Examples are dopamine, serotonin, and norepinephrine. The regulatory mechanisms for release of these and other neurotransmitters can falter in the aging brain, losing control of its release of neurotransmitters such as

glutamine an dopamine, resulting in devastating brain cell damage and destruction.

- **Fatty Acid Imbalance**
  A surgeon general report noted that excesses or imbalances of fats are related to 70% of all deaths in the U.S. This is a strong statement to make. Yet it points out what may be one of the most fundamental problems we face in this country. The problem with fats in particular relates to essential fatty acids. Fatty acids are essential to the formation and integrity of cell walls, immune function, etc. The body also requires essential fatty acids to maintain cell energy output. Aging causes alterations in enzymes required to convert dietary fats into the specific essential fatty acids the body requires to sustain life.

  Two fatty acids play a particular role in the formation of many aging-related diseases. It has been postulated that we evolved requiring a nearly equal balance of omega-3 and omega-6 fatty acids in our diet for good health. The reason is that the enzyme pathways which convert these essential fatty acids to specific hormones known as eicosanoids can get out of balance. Our body needs a balance between eicosanoid hormones that constrict blood vessels and those that relax blood vessels, pro-inflammatory and anti-inflammatory, blood clotting and blood thinning. A dominance of omega-6 fatty acids tips the scales towards an overproduction of eicosanoids which vasoconstrict, promote blood clotting and inflammation. Estimates are that the typical American consumes at least 20 times more omega-6 than omega-3. The effects of a fatty acid imbalance may manifest as an irregular heartbeat, joint degeneration, low energy, hyper-coagulation, dry skin, or a host of other common ailments associated with normal aging. Is it any wonder, then, that the rate of related diseases, heart disease, cancers, neurodegenerative diseases, and others, are on the rise?

- **'Longevity' Genes**
  A handful of genes that manage your body's defenses during stressful times can also dramatically improve your health and prolong life. Sirtuins, a family of genes that control an organism's ability to withstand hard times, may be master regulators of this survival mechanism. Sirtuins can cause changes throughout your body that render it temporarily revved up for survival. Activated over the long term, this stress response prolongs life span and forestalls disease in a wide range of organisms.

  Restricting an organism's calorie intake is the most famous intervention known to extend life span. Discovered more than 70 years ago, it is still the only one absolutely proven to work. The restricted regime typically involves reducing an individual's calorie intake by 30 to 40 percent, while avoiding malnutrition by consuming adequate vitamins, minerals and other micronutrients. Animals that remain on this diet not only live longer but also are far healthier during their prolonged lives. Most diseases, including cancer, diabetes, and even

neurodegenerative illnesses are averted. Calorie restriction acts like a biological stressor, activating Sirtuin genes (and perhaps others) like natural food scarcity that induces a defensive response to boost the organism's chances of survival. Its effects include changes in cellular defenses and repair, energy production, and activation of programmed cell death.

Radical calorie restriction is not for everyone and is best started under supervision of an experienced physician. Similar, though less dramatic, benefits might still be realized with a slightly less radical calorie restriction, and carefully selecting foods low in calories but high in micronutrients to avoid malnutrition. Fruits and especially vegetables are good examples of nutrient dense, calorie poor foods. Avoid supersizing your meals. Additionally, consuming Resveratrol, one of several compounds produced by plants in response to stress has also been found to modulate Sirtuins, suggesting that the plants may use such molecules to control their own Sirtuin enzymes. Resveratrol is present in grape skins, red wine, peanuts and mulberries.

The Role of Genetics in Aging

It may seem straightforward to conclude that the older we become the greater the impact genetics has on health and longevity. You don't have to search very far to see it. Perhaps you have noticed it right at home – in your own family. Some families, it seems, consistently lose loved ones, generation after generation, at a relatively young age, while everyone in other families seem to keep on going like the Energizer Bunny and never die before one hundred years. Have you known of some families plagued by disease that passes from generation to generation?

We are at a milestone in medical history, witnessing the unraveling of the human genetic code, with its seemingly infinite complexity. At every turn in the helix of our DNA, science discovers another link connecting our genetic makeup with the emergence of diseases. It is exciting to imagine the day when we will be able to have our DNA analyzed at birth and know what diseases we are at risk for developing so we can make wise choices to avoid them, or perhaps intervene with genetic manipulation. The surprising news is that our genetic makeup may be neither causative nor predictive for most of the diseases of aging. Lifestyle and environment are significantly involved in up to 75% of the major killer diseases in the western world. Only 10% of cancers, for instance, are genetically determined. The rest are due to environmental and behavioral influences.

The greatest fear most older adults have about growing old is losing their mind. Never mind that we might need supplemental oxygen to allow us to walk across the room, or take a drug to reduce our pain enough just to get out of bed. We might lose the ability to do things we used to take for granted. However, the very idea of losing our mind – lose the ability to develop and retain new memories and access old ones, or the diminished ability to solve problems and communicate with the rest of the world – that is the ultimate loss. Saying the word Alzheimer's disease in a room of people over 60 years of age is like yelling fire in a crowded theatre.

Alzheimer's disease is the most common form of dementia, accounting for nearly 80% of all cases of dementia. Alzheimer's disease will afflict upwards of 50% of those reaching 85 years of age. The remaining cases of dementia are largely the result of vascular disease. At least four genetic profiles have been identified that place individuals at greater risk for developing the disease. You can have the genetic testing to learn if you have a genetic predisposition for Alzheimer's disease. But you should also know that fewer than 10% of Alzheimer's cases are genetically inherited. In addition, 50-70% of the individuals who test positive for one or more of the genes for Alzheimer's disease never develop the disease. Having one of the genetic profiles for Alzheimer's disease may increase your risk, but it is neither causative nor predictive.

Our genetics may increase the chances of developing a disease. And it is clear that science is discovering greater linkages of genetics to disease and decline. Nevertheless, before you conclude that your future is carved on genetic stone there is some wonderful news. Scientists are discovering that genetic tendencies frequently require some action or behavior on our part (unhealthy lifestyle choices), or environmental factors, or both. Predictive genomics is just that; your genes merely express tendencies. Your lifestyle choices have a much greater role in determining what happens, or how your genes are expressed. In many instances, then, it is likely that when we look at our family history for longevity, it may be related more to family lifestyles or family environments that are passed along from one generation to the next.

If genetics plays a large role in longevity, it is usually in children. It is the younger age groups that are most impacted by genetic, inherited, diseases that we are less able to control. Examples include juvenile Onset Diabetes (Type I diabetes) and congenital heart disease. Almost all the degenerative diseases of aging, including cardiovascular disease, cancer, type 2 diabetes, and Alzheimer's disease, are the result of the interaction between genetic and environmental factors. Nevertheless, the fact remains that the older we become the smaller the role genetics plays in determining our longevity. As we age longevity is more about choices we make, and that is the good news.

Enter Preventive-Aging Medicine

Consider the following U.S. estimates:

- In-hospital adverse reactions to prescribed drugs 2.2 million per year
- Unnecessary medical and surgical procedures performed 7.5 million per year
- Number of people exposed to unnecessary hospitalization 8.9 million per year.
- Unnecessary antibiotics prescribed for viral infections 20 million per year

By one recent estimate, the annual mortality associated with conventional medical intervention approaches 800,000 per year. In contrast, heart disease, the recognized leading killer in the U.S., accounts for 700,000 premature deaths annually. This would make the American medical system the new leading cause of death and injury in the U.S.

The degenerative diseases of aging are already one of humankind's greatest challenges: heart disease, cancer, strokes, diabetes, and Alzheimer's disease

prematurely kill and disable millions of people worldwide. Yet nearly all aging-related diseases occur needlessly, because more than 75% of them are preventable. Now add to this list the preventable deaths due to unnecessary medical interventions.

America's baby boomers and seniors spend more than a trillion dollars a year to diagnose and treat their diseases. The sad fact is, those same diseases are basically preventable and frequently reversible. Most Americans think they are "well" as long as an illness has not yet been diagnosed. However, the average individual, through a lifetime of unhealthy choices, is in the process of creating disease. Why wait to end up with the unwelcome symptoms of a disease that develops because you have been making unhealthy choices, when you can make the right choices and prevent or reverse the process in the first place? The very same choices are also the most effective means to minimize your exposure to potentially avoidable medical interventions, medical errors, and needless medical expenses.

The average person won't call his or her doctor until after a medical problem exists, as opposed to seeing the doctor to prevent it. Furthermore, most doctors are not focused exclusively on aggressive disease prevention and health optimization. I am frequently asked the following questions: "What is preventive-aging medicine?" "What does it do?" "How is it different than 'conventional' medicine?" First, let me emphasize that preventive-aging medicine does not prevent one from growing old. Moreover, it is not anti-aging. On the contrary, it is about celebrating growing old; celebrating the experiences that you and I continue to gain that can only come through living, and hopefully the wisdom that follows. Preventive-aging medicine seeks to celebrate growing old, while maintaining or improving functional abilities as long as possible, and maintaining or replenishing youthful vitality. In other words, the goal is to increase health expectancy, and maybe to live longer or have an increased life expectancy, but only if certain conditions are met: 1. we remain strong and vigorous, 2. we are creative and happy, and 3. we are spiritually satisfied. Most people would probably not choose to live longer with disability, chronic illness, or cognitive impairment.

Preventive-Aging Medicine, as a specialty, is an extension of preventive health care. It employs screening, risk assessment and early intervention for the improvement of physiological, cognitive, emotional, and physical functioning. Early detection, prevention, and reversal of aging-related disorders and diseases are the goals. Preventive-Aging Medicine seeks to restore vitality, youthful reserves and your capacity to prevent, minimize or eliminate aging-related disease.

Your Biological Age - How Old Are You?

You know how many years old you are. However, do you know how your body compares biologically and functionally to people at different chronological ages? Some call this our biological age. Traditional medicine has given us glimpses of our biological age using risk factors. You can know your relative or actual risk for developing a variety of age-related diseases, or your risk for dying. Insurance companies have used actuarial tables for years to set your life insurance premium, based upon your risk of dying compared to others your age. It is not easy, however, to look at a statistical

analysis of your risk factors and easily make the data real – living and breathing like you. If the doctor were to tell us that our Framingham ten-year risk for coronary heart disease is 19%, most of us would have difficulty translating that into the real world as it relates to our own life.

If we could distill dozens, or hundreds, of measurable risk factors down to one number easily interpreted by anyone that provided a tangible, real world, translation of the impact from genetics, environment, and life-choices on one's potential longevity, it would be biological age. If you are 55 years old, for example, and you discovered that your body is functioning biologically equivalent to someone 13 years older, that is easy to grasp. You could just look around and see many examples of people 67 years old. Observing a 67-year-old drives home the significance of all those risk factor data points in a very real way. Determining biological age is a very tangible way to see ourselves.

There is yet no standardized set of biomarkers of aging. To qualify as a biomarker for aging, however, certain criteria should be met: 1. it should result from a cellular change in us, and 2. it should be a universal change; something that happens to everyone, 3. it should be a gradual change, rather than abrupt, so it can be measured over time, and 4. it should be measurable. We can all relate to some very noticeable examples. Graying of hair is the result of a cellular change in the hair follicles; they lose the ability to incorporate melanin into the strand of hair. Melanin gives color to hair and when it is absent, what remains is gray or white. It is similar to the change in the color of leaves in the autumn when the chlorophyll, which gives the leaf its green coloration, dies. You might have noticed that graying hair happens, eventually, to everyone (if they haven't first lost all their hair). Therefore, it is universal. It is gradual in onset, developing over the course of many years. In addition, it is easily measurable. Another example involves the eye. Most people notice, beginning around the fourth decade of life, a slowly progressive decline in the ability to see clearly the words on the morning paper. The lens of the eye begins to lose accommodation. A cellular change alters the ability of the lens to change focus at different distances. You eye doctor can precisely measure the change.

We can do something about both examples of biomarkers of aging. Gray hair can be dyed, cut off or covered with a cap. Eyeglasses or eye surgery can correct for the change in vision. One thing that cannot be done yet is prevent these changes from taking place. Additionally, as biomarkers, they do not tell us very much about one's risk for other, deadly, declines – heart disease, cancer, dementia, etc.

Preventive-aging physicians are interested in other, more meaningful, biomarkers of aging, such as:

- Loss of lean body mass and strength
- Decline in aerobic capacity
- Decline in immune function
- Decrease in lung function
- Increase in body fat
- Difficulty maintaining the body's thermostat

- Imbalance in hormones
- Increase in systolic blood pressure
- Increase in silent inflammation, and glycation

To be of practical use, a biomarker should supply useful information about one or more of the following:

- One's relative function or performance compared to others of the same age, to give the patient some idea of potential for improvement
- One's risk for dying or developing a pathological disease of aging
- One's functional biological age equivalent
- whether it is modifiable or non-modifiable

When possible, biomarker measures that are modifiable or amenable to improvement provide opportunities for individuals aspiring to live 'younger' with objective means of monitoring their progress. While gray hair is not truly amenable to change, muscle strength is. It is easy to measure and compare someone's lean body mass with others of similar age, and gauge the potential for personal improvement. Diminished lean body mass is clearly associated with various risks for aging, such as hip fractures from a fall, CHD, and elevated blood sugar. Declining lean body mass, without intervention, correlates well with age. After the age of 25 we will predictably lose approximately 6 pounds of lean body mass every decade. Between the ages of 25 and 70 years a significant loss of motor neurons and muscle fibers will occur. This biomarker is very amenable to improvement or reversal, at any age.

When all the factors commonly used to assess biological age are considered, it appears possible for us to have a biological age as much as one to two decades older than our chronological age. In other words, we could die 10, 15, or even 20 years earlier than necessary. The leading cause of death in the U.S. is heart disease. Another way to say it is that Americans' cardiovascular systems are aging much faster than the rest of the body. The big question is what can we do to slow this premature and preventable aging of our body?

Normal Isn't Always Optimal

How many times have you been to the doctor and you were told that your test results were normal? You get told your examination was normal. In fact, that is what we generally hope to hear. But what does "normal" mean? It refers to the fact that your results fell within a range of values, the norm, for a population. The reference range for tests is a bell-curve representing the frequency of occurrence for a given test result. Frequently the reference range is expressed as 1-2 standard deviations from the mean. The 'normal' reference range may be simply the average range for a population, whether or not the population is healthy. When I entered medical practice in the 1970s, a cholesterol level of 275 was considered normal, because the population had a cholesterol level that included a cholesterol levels above and below 275. Of course, no one would call a cholesterol level of 275 normal anymore. In other words the normals for a test may simply be comparing you to others in the population who are already aging unnecessarily fast or are diseased to begin with. The reference range for

cholesterol has since been modified to more closely resemble a desirable range for good health. Unfortunately, the cholesterol level for the average adult in this country, at 225, lies above the upper limits of what is called normal. Sadly, the average cholesterol level for the U.S. adult, at 225, is the same as the average cholesterol level of for victims of heart attacks.

The reference range for some tests is age-stratified. When this happens, you may have a test result that falls within the reference range for your age, but may in fact be quite low when compared to the reference range for someone in their 20s and 30s. Sometimes the normal range for test results simply describes the limits, which above or below, would be correlated with measurable disease. Some tests have broad ranges of normal. Could it be that diseases may be occurring with test results within a normal range, but the disease is just not yet detectable? Is it possible that within that range there might be a narrower, optimal, area that would be associated with peak health? Is there a test range for you, individually, that might be best; a level that could optimally reduce your personal risks or maximize your unique potential for health? I think so.

Would an Olympic athlete be satisfied learning that his/her performance on the racetrack was “normal”? No. The only thing that will satisfy him/her is “optimal” performance. The same should hold for you and me.

Preventive-Aging Medicine Strategy

What if tonight you tune in to the evening news and learn that one of the major drug companies announced the introduction of a new vaccine that could prevent 90% of all initial heart attacks? Would you want the vaccine? I would. Imagine that you pick up the latest issue of Newsweek and it has an unbelievable cover story – a major pharmaceutical company has developed a cure for more than 60% of all cancers. Would you buy their stock? I would. How about a new treatment to cure at least 90% of all cases of adult-onset diabetes? These sound like distant dreams.

However, a study published in a 2004 issue of Lancet found that 90% of first-time heart attacks likely resulted from preventable lifestyle choices. Nine out of every ten heart attacks probably never have to occur. Previously, researchers thought that only about half of heart attacks were explained by risk factors such as smoking or cholesterol. However, the study of risk factors for first-time myocardial infarction in 52 countries and over 27,000 subjects says that the cause of almost all heart attacks can be pinpointed to one or more of the following:

- Smoking
- Abnormal cholesterol
- Diabetes
- High blood pressure
- Stress
- Abdominal obesity
- Sedentary lifestyle
- Eating too few fruits and vegetables
- Abstaining from alcohol.

We don't need a vaccine to prevent most heart attacks; we can already do it.

The American Cancer Society has been telling us for years that most cancers are completely avoidable. They report that 90% of all cancer is environmental. Better than 90% of all cases of lung cancer result from one avoidable lifestyle – smoking. At least one-third of all cancers in the U.S. are related to diet alone. The ACS reports that 90,000 cancer deaths could be avoided every year in the U.S. if adults did one thing – maintain a healthy level of body fat. The fact is that an estimated 300,000 needless deaths, from all causes, occur in the U.S. annually as a result of obesity. It would be great to cure most of the cancers that we see, but it is far more exciting knowing that we don't have to suffer them in the first place because they can be prevented. The same is true for adult-onset diabetes, now appropriately called a lifestyle disease.

We don't need drug companies to invent treatments for diseases that we already possess the ability to prevent. The opportunity exists within each one of us to make meaningful and lasting changes which have the potential to steer us clear of the pathological diseases traditionally thought to be a natural part of aging.

Instead of treating the diseases of aging, such as: heart attacks, cancer, strokes, Alzheimer's disease, diabetes, chronic inflammation, immune system decline, why not prevent or treat the causes? To be most effective, all pathways of aging must be addressed. We can't, for example, take a handful of antioxidants and be certain we are providing adequate protection from oxidative stress, when we maybe just consumed a huge meal which will generate far more free radicals than we could mop up with a few antioxidants. On the other hand, maybe we haven't effectively dealt with the stress in our life, which is also a source of free radicals. There is a connectedness to all things in our life, especially when it comes to health.

Traditional medicine focuses on treating the effects of the aging process, while preventive-aging medicine concentrates on treating the causes of aging. Increasing lifespan requires both a reduction of premature deaths and management of the biological processes of aging.

Your Living Younger program rejects the current dismal and disenchanted view of aging. The darkness of diminished functioning is far more related to a lifetime of unenlightened choices than it is to the ticking of an unrelenting clock. And it is not content to rely only on downstream approaches that expensively examine symptoms and appearances, while leaving the upstream causes undiscovered and unaddressed.

The Living Younger program is based on the belief that rejuvenation is possible and healthful revitalization is waiting. It is founded, too, on the belief that we can still free our ideal self from the rock of our less-than-ideal habits. But now is the moment to act, for while we cannot go back and make a new start, we can start today to make a new ending. Together we will usher in a new age of enlightenment that will bring about the enlightenment of aging.

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NOTES

Optimal Nutrition for Living Younger

"The beginning is the most important part of the work" - Plato

Could your diet be killing you? I believe so. The greatest threat to your health today is likely a result of what you are eating. Food is not simply a source of energy, but a crucial factor in mental and physical well-being. Optimal nutrition contributes to the prevention and reduction of risk factors for many diseases and enhances certain physiological functions. The statistics to back it up are staggering. Today the leading killers in this country are heart attacks, strokes and cancer. Yet, it is estimated that at least 90% of first-event heart attacks are preventable. Two-thirds of all cancers occur needlessly. The American Cancer Society reports that diet alone is responsible for at least one-third of all cancers. A U.S. Surgeon General report concluded, "Imbalances or excesses of fats are involved in 70% or more of all U.S. deaths."

Two-thirds of Americans are overweight or obese, a risk that will soon surpass smoking as the leading preventable cause of death in this country. A 2005 report indicated a slight increase in average life expectancy in the U.S. to 77.6 years. Sadly, it is likely to take a significant dive in the near future, as the weight of Americans will cause average life expectancy numbers to crash. The good news is that you still have the opportunity to improve your health, your quality of life and your longevity by mindfully choosing what you eat, when you eat, and how you eat – with a nutritionally mindful lifestyle.

Recent decoding of the human genome has propelled an emerging field of science called nutrigenomics, which studies the complex interplay between diet and genes and how nutrition influences health. A primary goal of nutrigenomics research is the development of effective dietary intervention strategies designed not only to treat, but also to prevent disease. Scientists have discovered that certain substances (food chemicals) can change the expression of genes and even the genome itself. Although it is well established that diet is a big factor in chronic disease risks, scientists have also found that individual genetic makeup (propensity) also must be considered. So, one-size-fits-all solutions aren't the answer either.

Today's fast-food lifestyle makes it even more challenging to eat properly. The family seldom prepares and eats meals together any more. Moreover, exposure to an endless array of the latest dietary recommendations makes it difficult to sort fact from fiction. What is a person to do?

A Mindful Lifestyle of Nutrition

This chapter is not only about the nutritional aspects of a healthful diet. A mindful, nutritional lifestyle does not result from simply purchasing the latest diet book (amongst thousands) and mindlessly following its recommendations to consume a certain number or type of carbohydrate, protein, and fat. Although we will certainly go into some depth about the dietary elements known to nourish and support optimum aging, think of them as the details. Just as important is the way in which food and eating is part of life. That

is why it is called a nutritional lifestyle. It is by way of a healthful lifestyle that the details of nutrition make the difference between failure and success, frustration and pleasure, boredom and joy. This book is about every aspect of living, including eating. If you take away nothing else from this chapter, it is that a healthy nutritional lifestyle is an act of mindfully, intentionally, and consciously engaging life through food.

Another challenge to achieving optimum nutrition comes with increasing age; eating wisely becomes progressively more important as we grow older. It is estimated that 17-50% of the country's seniors are undernourished because of reduced metabolism, diminishing appetite, effects of medication, and consumption of processed foods of low nutritional value. Many age-related changes impact digestion for seniors, including reduced saliva production, wear and tear on teeth, reduced digestive acid and enzyme activity, reduced absorption of food, and slowing of the movement of food through the intestines. Additionally, losses of vision, smell and taste alter the types of foods a person prefers. Finally, older people usually require fewer calories because of changes in metabolism and decreasing physical activity. By maintaining old eating habits, most people gain weight more easily as they age.

The place to begin the journey to youthful vitality and optimal aging is within. Listen to your body and what it has to tell you about what it needs. Take time to become aware of how your body feels in different situations, including before, during, and after eating. For example, when we feel hunger we learn very early on that consuming refined carbohydrates give us an immediate sense of satisfaction. However, not long afterward hunger and fatigue set in. It is the body's way of telling us that we need something more sustaining. You might notice you are more mentally alert and sharp after balanced meals than meals low in protein or high in high-glycemic carbohydrates. Paying attention to clues and messages about your needs and the effects various foods have on you is a very important first step.

What does food mean to you? At its most basic, it is a necessity for fueling your body and it provides nutrients essential for various bodily functions. At other times, food plays a significant part of social connections. Food can bring great pleasure and joy. Many times, too, we eat out of boredom or to deal with stress. Eating can simply turn into a mindless habit. Becoming conscious, mindful, of why you are eating is necessary before behavior can be changed in a desirable way. Recognizing that the food we consume is made from the elements of nature, and we are made from the food, connects us with the universe.

Another step toward a balanced nutritional lifestyle involves making good choices about what and when you will eat, rather than grabbing whatever you can find at the last minute, or choosing to stop at a fast-food restaurant. Research shows nutritional health is as much about how you eat as it is the foods you eat. Think about what your day will be like and plan ahead. Consume produce when it is at its peak of ripeness. When you shop for produce, try to purchase it as close to the source as possible, for example going to the farmer's market instead of the super market. Whenever possible, select fresh instead of canned, or commercially prepared. In many of the traditional

Mediterranean regions, you won't see the large capacity, double-door refrigerators found in the typical American kitchen. Why? Because when you go to the market every day and eat the food fresh and at its most wholesome you don't need a large refrigerator. This may be part of the secret that has made the Mediterranean diet (read 'lifestyle') one of the most healthful known.

The typical nutritional lifestyle in the U.S. today involves eating out more than 30 percent of the time. For many people, fewer than of their meals are prepared at home. A typical scenario involves placing an order through the car window, into a microphone, to a stranger, then having everything handed to you wrapped in paper. You don't really know what ingredients are in the food, and don't care because your mind is elsewhere as you drive off and eat while continuing a conversation on your cell phone. And how about those prepackaged items in your freezer, which take less time to cook in the microwave than the time required to read the lengthy list of ingredients which reads like a chemist's dictionary?

Being mindful while eating, and not being distracted during meals (e.g. watching television), improves digestion and helps keep weight gain at bay. Stop multi-tasking while you eat. When you eat, eat. Lack of attention to eating translates into decreased blood flow to the digestive system. The brain must experience taste, pleasure, aroma, and satisfaction so it can accurately assess a meal and catalyze the most efficient digestive force needed for that particular meal. Eat fast and your brain simply says, "I don't remember eating anything. I am still hungry."

For something completely different, make meal preparation a creative opportunity to involve family or friends. Dine with others, sharing in the goodness of earth's bounty. Turn off the cell phone and speak with a living breathing human face to face. Eat at a table, not behind the wheel or in front of the television. Appreciate the connectedness of the moment with the universe; the food you are about to eat literarily contains elements of the universe within each bite, and you are making it part of you. Food is our tangible connection with the universe. Meals provide a way to connect with others as well. Dining is more than consuming. It is about sharing nature's bounty with others. It is about engaging in conversation that does not detract from the wonder and connectedness of the food. It is about sharing memories, experiences, and laughter.

The Fads versus the Facts about Dieting

Of all the healthful reasons to learn how to eat well, weight loss has become the Holy Grail driving the frenzy behind most diet books and fads. Unfortunately, fad diets usually fail to help anyone reach and maintain this goal, on a number of counts. Many are too complicated to continue for very long. Some over-simplify, ascribing to the notion that if it is easy enough, we will stick with it. Sometimes they play on our intense and often overwhelming desire to grab the gold ring of weight loss, even if it means jeopardizing overall health - remember the grapefruit diet? Most promise quick results, appealing to the no-waiting, fast-food generation, despite frequent admonishments from nutritionists that healthful, safe, and lasting weight loss is best accomplished slowly. Even the food industry has gotten into the act: the dairy industry promotes controversial

data suggesting that consumption of dairy products enhances weight loss. The apple industry has done the same. The most insidious problem with fad diets is that they often tend to rob from Peter to pay Paul.

The tempting offer of easy, painless, weight loss is made too often at the expense of optimum health. One recently popularized diet trend promotes a high protein, low carbohydrate approach to weight loss. The Atkins diet, for instance, requires eating less than 80 carbohydrate calories per day for the first few weeks, which is a starvation level of carbohydrates. After that, it will take five months before you can eat more than four hundred carbohydrate calories per day. A healthy body results, in part, from a balance of all three macronutrients - carbohydrate, protein, and fat. Severely restricting any one macronutrient is essentially a form of starvation. Starvation is definitely not the way to lose weight. Limiting consumption of refined and starchy carbohydrates is desirable, but the Atkins' restrictions placed on the number of carbohydrates from fruit limits a wonderful source of soluble fiber, many essential micronutrients, and other protective phytonutrients. Moreover, a high protein low carbohydrate diet alters the acid/base balance of the body, driving it in to a mild state of ketoacidosis. The human body requires pH, the degree of acidity, to be maintained in a narrow range. Over-acidifying body fluids and tissues underlies many diseases. Changing the acid/base balance has a negative ripple effect on everything from the immune system to the amount of inflammation in the body, waste breakdown and disposal, and cellular function.

While studies have shown that a high-protein, low-carbohydrate diet can result in the loss of body fat, the long-term price may not be worth it. High protein diets tend to promote dehydration, an already too common condition that can accompany aging. Very high protein intake facilitates calcium loss from bones, increasing osteoporosis risk. Diets like the Atkins program permit too much animal fat, high in heart-disease promoting saturated fat. Furthermore, consuming too much arachidonic acid, another fatty acid found in red meat, contributes to the formation of most of the degenerative diseases of aging. Evidence points out that the high (animal) protein fad may initiate the development of silent inflammation, resulting in heart disease, some cancers and dementias, diabetes and inflammatory diseases like arthritis. Many scientists now recognize inflammation as part of the basis for obesity. Some speculate that long-term compliance with this kind of diet increases the risk for various cancers, heart disease, and the neurodegenerative diseases such as Alzheimer's disease. You might think of this high protein, low carbohydrate diet a pro-aging diet.

At the other end of the spectrum is the Dean Ornish diet. This program promotes very high carbohydrate intake and very little fat. Dr. Ornish was among the first to demonstrate that coronary artery disease is reversible. This is wonderful news. It is easy to conclude that the reversal of coronary artery disease is attributable solely to the Ornish diet, yet those individuals in the studies who were found to exhibit some reversal in existing coronary heart disease also followed a strict regimen of exercise, meditation and lifestyle modification. It is likely that the other major lifestyle changes played a significant role in the outcome. Importantly, the Ornish diet is very difficult for many to

follow, with evidence found in the high dropout rate; not a desirable trait of a lifelong diet.

Ironically, the more diet books have proliferated, the heavier Americans have become. Moreover, a substantial difference can exist between promoting weight loss and promoting health and wellness. As we have seen, not every weight-loss plan offers a healthful, sustainable means to lose weight.

An optimum dietary lifestyle, on the other hand, should be able to satisfy specific important criteria:

1. A substantial body of evidence that it reduces risk or delays pathological diseases of aging, improves overall health, and/or increases longevity. There are kinds of evidence used to substantiate a theory, treatment, or intervention
   a. In vitro studies. Basic science research can demonstrate that chemically or physiologically something is valid,
   b. Epidemiological observations of outcomes associated with the behavior, diet or lifestyle of populations, and
   c. Clinical trials.

   The best evidence is when all three sources of information agree.
2. Improves measurable parameters of health. A diet that works for you should be validated by accepted objective measures, such as body fat, blood pressure, blood sugar, and lipid profile, markers of inflammation and methylation, and so forth.
3. Is sustainable for life, as an integrated part of one's lifestyle. While strong evidence may exist that an Okinawan diet confers greater health, it may not become widely accepted by Americans. More than 90 percent of Americans who begin a diet discontinue it. We don't stick with things that are too much work, too complicated, unfamiliar, that give us negative feedback, or are not authentic to whom we are. Choosing a nutritional lifestyle that can be readily adopted and easily integrated into our life is as important as the nutritional value it offers.

Concerning these criteria, three dietary lifestyles stand out. Let's take a look at them, one at a time.

The 'Original' Human Diet

There are races of people who are all slim, who are stronger and faster than we are. Arthritis, diabetes, hypertension, heart disease, stroke, depression, schizophrenia and cancer are unusual for them. These people are the remaining tribes of hunter-gatherers in the world. They share a secret that is over 2 million years old. Their secret is their diet – a diet that has changed little from that consumed by the first humans 2 million years ago, and their predecessors up to 7 million years ago. Theirs is the diet that man evolved on, the diet that many scientists believe is the only one coded for in our genes.

Known today as the Paleolithic diet – it contains only those foods that were "on the table" during our long evolution, and discards those which were not. In other words, the Paleolithic Diet is the diet that we humans are genetically adapted to eat. It consisted

entirely of organic whole foods at hand, and in season. The diet contained a generous amount of lean protein. Fruit, berries, and vegetables comprised the carbohydrates. Fats were mostly healthy fats. Except for meat, most foods were consumed raw. The foods consumed by humans throughout most of history consisted primarily of:

- Fish
- Lean meat (wild game and poultry, low in fat and low in omega-6)
- Eggs
- Vegetables (included most root vegetables, except potatoes and sweet potatoes)
- Fruit
- Berries, e.g., strawberries, blueberries, raspberries, etc.
- Nuts, e.g., walnuts, Brazil nuts, macadamia, and almonds
- Seeds

The greatest challenge most Americans experience beginning a Paleolithic diet comes with eliminating or dramatically reducing intake of foods not a part of the Paleolithic diet:

- Grains – including bread, pasta, noodles, cereals
- Beans – including string beans, kidney beans, lentils, peanuts, snow-peas and peas
- Potatoes
- Dairy products
- Sugar
- Salt

This was humanity's preferred diet for something like 2.5 million years, and humans have changed genetically only 0.005% since the introduction of agriculture.

The evolutionary benefits of the Paleolithic diet make sense when you examine the conditions under which early man evolved. Our early ancestors lived a very active lifestyle, mostly outside. They faced significant environmental challenges, such as famine, drought, and climate extremes. The threats they faced were "really dangerous;" imagine being chased by a saber toothed tiger!

- Throughout most of human history, food was scarce, and it required a great deal of effort to acquire it. Those who ate the most calories staved off famine and had the energy to reproduce. As a result, we are programmed to prefer calorie-rich foods.
- Insulin resistance provided early man with a survival advantage by facilitating fat storage, so he could survive famines. Today famine is almost nonexistent in this country; instead we have too much to eat. With no shortage of food and a very high percentage of it being comprised of high glycemic carbohydrates, insulin resistance is no longer an advantage but rather a distinct disadvantage to our survival.
- Thyroid resistance may have been another genetically evolved advantage for survival. The thyroid gland secretes hormones that rev up metabolism, burning more energy. During times of stress, illness, or famine it would be advantageous to convert the thyroid hormone T4 into reverse T3, an inactive form of the thyroid

hormone T3. The result is a reduction in metabolism, conserving energy and calories. Today the purpose served by developing thyroid resistance works against us.

- Anti-inflammation resistance may have helped our ancestors survive frequent acute infectious diseases and trauma. A hyper-responsive inflammatory system was previously the only way to survive microbial or parasitic invasions. Those of us with overactive immune systems had a better chance of survival than those with weaker immune defenses. With far fewer causes for inflammation today, having an inflammatory system which responds easily works against us.

The evolutionary changes that genetically favored survival were perfectly matched to the existing diet. Compared to our Paleolithic ancestors, our DNA has evolved very little (less than 1/2%), genetically coding us with the same tendencies for insulin, thyroid, and anti-inflammation resistance. We also inherited a genetic predisposition for an intense inflammatory response.

If our DNA hasn't changed, then what has? Our living conditions, lifestyle and diet changed - dramatically. In contrast to our early ancestors, the average American leads a comparatively sedentary lifestyle. Because of our relatively recent successes with sanitation and immunizations, Americans face far fewer infections and trauma than did our ancestors. Today our threats are more perceived than real; the pressure of preparing for a boardroom presentation, getting the kids to soccer practice on time, et cetera. More than anything, our diet has changed radically, including a significant excess of carbohydrates. Our diet no longer matches our genetic needs. It is in our genetic code to prefer diets high in fat and sugar. The problem is that today there is a complete mismatch between biology and the environment. Our physiology tells us to eat food whenever it's available. But food is always available today. The genetic factors which helped our Paleolithic ancestors make it to reproductive age, are killing us today! Scientists believe that our dietary changes are at the root of nearly all aging-related diseases today.

Around 10,000 years ago, an enormous breakthrough was made – a breakthrough that was to change the course of history, and our diet, forever. This breakthrough was the discovery that cooking grains made them edible – the heat destroyed enough toxins to render them edible. Grains include wheat, corn, barley, rice, sorghum, millet and oats. Grain based foods also include products such as flour, bread, noodles and pasta.

Agriculture made it much easier to store and transport food. Food storage also enabled surpluses to be stored, freeing some people from food gathering to become specialists in other activities, such as builders, warriors and rulers. This in turn set us on the course to modern day civilization. Despite these advantages, history suggests that our genes were never developed with grains, beans and potatoes and, and still are not.

Instead of being able to eat only a fraction of the animal and plant life in an area, farming allows us to fill a particular area with a large number of edible plants and animals. This in turn increases the number of calories that we can obtain from an area

by some 10 to 100 fold or more. Then followed the harnessing of dairy products, allowing man to obtain far more calories from the animal over its lifetime than if it were simply slaughtered for meat. Dairy products combine a variety of components – some of which our genes were ready for and some not. While cow's milk is ideal for calves, there are several very important differences between it and human milk. For example, the brain of a calf is only a tiny fraction of its body weight whereas humans have very big brains. Not surprisingly, cow's milk is low in critical nutrients for brain development, particularly omega-3 fats.

Diets that are high in grains, beans, and potatoes exhibit a number of problems for humans:

- They contain toxins in small amounts. These toxins include enzyme blockers, lectins and other types. Cooking destroys most but not all of the toxins
- They are generally rich in high glycemic index carbohydrates
- They are relatively low in some vitamins, minerals, antioxidants and phytosterols – i.e., they are the original "empty calories"

Notably, with the widespread acceptance of agriculture came the emergence of certain health problems – dental disease, heart disease, obesity, etc.

The Mediterranean Secret to Healthy Aging

Overwhelming evidence supports the effectiveness of a traditional Mediterranean diet to improve health and prevent disease. It, too, has withstood the test of time. Moreover, it is a strategy enjoyable and relatively easy to adopt by Americans, and is more likely to be successful over the long term than most other 'heart-healthy' diets. Traditional diets among some Mediterranean cultures, that is before the introduction of fast-food, emphasize eating a wide variety of whole, natural foods, especially fruits and vegetables, whole grains, fish, olives and olive oil, nuts and other legumes, and moderate amounts of wine. Eating the Mediterranean way is also about eating foods fresh and in season. The diet keeps processed "starchy" carbohydrates and saturated fats to a minimum and is essentially devoid of trans-fatty acids.

A recent study showed that the risk of heart disease could drop by as much as 45% for people following a Mediterranean diet. Another recent study found that those who met most of the criteria for a Mediterranean diet lowered their risk of heart attack by more than 80% compared to those who met only one or two criteria. In addition to reducing heart disease and cancer, the studies show that a Mediterranean diet may help individuals more successfully control their weight. Seniors who combine a healthy lifestyle with a diet rich in fruits, vegetables, and "good" fats, particularly olive oil, significantly increase their life expectancy, according to a study published in The Journal of the American Medical Association. Overall, those seniors adhering to a Mediterranean diet showed a 23% lower risk of death from all causes. The researchers looked at the effect of this diet alone and in combination with three risk factors: smoking, exercise, and moderate alcohol use. Seniors who adhered to all of these lifestyle changes reduced their risk of death by 65%.

Another study published in a 2005 issue of the American Journal of Clinical Nutrition found that eating a daily mix of cholesterol-lowering food, as is found in a traditional Mediterranean diet, could reduce cholesterol, after only one month, nearly as well as the widely prescribed statin drug lovastatin. These foods included vegetables (particularly eggplant and okra), soy protein, psyllium seed, almonds, barley, oats, and plant sterol margarine spread. Consuming more plant foods and less animal fat is probably the best nutritional strategy for lowering cholesterol and possibly reversing atherosclerosis.

Following a Mediterranean diet can help protect women from developing breast cancer. Oleic acid, the main component of olive oil, blocks the action of a cancer-causing oncogene called HER-2/neu, found in approximately 30% of breast cancer patients. In addition to down-regulating this important oncogene in breast cancer, oleic acid improves the effectiveness of the breast cancer drug Herceptin.

There are literally hundreds of so-called diets and weight-loss programs, many of which are very difficult to continue consistently because they require significant changes in eating habits. In contrast to these extreme diets (e.g., Atkins or Ornish), the Mediterranean diet does not require radical alterations in eating habits - just a shift toward more healthful choices.

The 'Less is More' Approach to Longevity

The U.S. has become 'Super-sized,' in its eating habits and in the waistline. We are ingrained to believe that more is better. To look at recent data on life expectancy in America, however, you wouldn't initially guess that eating more is hurting us. Currently, the average adult life expectancy has risen in the U.S. to an all-time high of 77.6 years. Not bad, considering that for most of human history the average life expectancy remained at less than 25 years, until about 150 years ago. Life expectancy in the U.S. is not the best either, when compared to the Japanese, who have an average life expectancy of more than 80 years. Nevertheless, how is it that life expectancy has increased in the shadow of the fattening of America? Sadly, the data does not offer good news of a declining incidence of the killer diseases, such as heart disease and cancer. In fact, these problems continue to grow.

Most of the recent increases in life expectancy in this country resulted from the sickcare system keeping us alive longer, albeit while still diseased and at a low level of functional capacity. In other words, modern medical miracles sustain lives, but in a diseased state. The American diet has not contributed to the recent increases in longevity; we are an overfed, but undernourished nation. With the continued rapid increase in the girth of Americans, it is only a matter of time before the current average life expectancy crashes under its own weight. The generation being born today is likely to become the first generation in history to have an average life expectancy less than its parents.

A solution to this potentially dark future may lie in the recent past. Studies conducted at Cornell University in the 1930s offer hope for more than increasing health and the average life expectancy of humans, but even the possibility of an increased maximum

lifespan. Scientists wondered what might happen to rodents fed far fewer calories than thought to be require for good health. Restricting their calories by 30%, you would expect them to become malnourished, subsequently diseased, and ultimately die prematurely. But the scientists wanted to avoid malnutrition usually seen in the underfed, due to deficiency of nutrients - vitamins, minerals, phytonutrients, etc. The rodents were given fewer calories by restricting carbohydrates, protein and fat, but they were supplemented with a full complement of nutrients. What happened surprised everyone.

Rather than experiencing an increased incidence of health problems and diseases, as one might expect, the rodents fed this calorie-restricted, nutrient-rich diet looked younger, aged more slowly, and developed fewer diseases compared to the control group who ate a 'normal' diet. More startling yet was the endpoint of the study. The reduced-calorie rodents lived 30% longer the control rats in the study. They exceeded the expected maximum lifespan for their species!

Similar results have been observed with calorie restrictions of 25-40% while maintaining optimum intake of nutrients, in nearly 1500 species tested - including fruit flies, worms, frogs, mice and rats, and monkeys. Not only do they develop fewer chronic diseases, but also they live longer than the control groups and in many instances significantly longer than the maximum lifespan for the species tested. To date the preponderance of evidence suggests that calorie restriction, while ensuring optimum nutrition, is the only method known to extend the lifespan of a species. Calorie restriction can increase maximum animal lifespan by up to 50%. That would be equivalent to humans living 150-180 years! This may be the closest thing to the proverbial Fountain of Youth. Cicero said it well long ago: "To lengthen life, lessen thy meals."

After more than 40 years of research, a nutrient-rich calorie-poor diet is unequivocally the most effective strategy for slowing most or all of the aging processes. Research shows calorie restriction to be protective in the brain of primates. Neuroprotective factors, such as BDNF and GDNF are present in greater levels after calorie restriction. Heat shock proteins like HSP-70 and GRP-78, other protectors in the brain, are also increased with calorie restriction. Studies show that calorie restriction may even help some neurodegenerative diseases, such as Alzheimer's disease and Huntington's disease.

Benefits of Calorie Restriction

- Protection against cardiovascular disease
    - Lower systolic and diastolic blood pressure
    - Improved diastolic function
    - Decreased low-density lipoprotein (LDL) and triglycerides
    - Reduced arterial plaque formation
    - Possible reversal of accumulated plaque
- Lower body fat
- Protection against diabetes
- Decreased inflammation

- Defense against cancer
- Protection from autoimmune diseases such as rheumatoid arthritis
- Better DNA repair and maintenance

Remember, calorie restriction with optimum nutrition is not the same as malnutrition, fasting, or starvation. A calorie-restricted diet must provide adequate levels of protein to preserve lean body mass, essential fat necessary for the production of eicosanoids hormones, and enough carbohydrate to maintain adequate brain function. At the same time, it must provide optimum levels of all micronutrients. It requires eating foods with a low calorie density and a high nutrient density, throughout the day to maximize micronutrient intake. Why does it work?

One of the most powerful biological pathways of aging occurs from free radical production and subsequent oxidative stress. The primary source for free radicals in the body is the conversion of food to adenosine triphosphate (ATP), the form of energy used by every cell. The greater a cell's exposure to free radicals, the greater the damage incurred. The more food we eat, then, the more free radicals that are produced. This explains, in part, why obesity is so dangerous; overeating leads to free radical damage and disease. Calorie restriction, on the other hand, results in fewer free radicals being produced and fewer diseases.

Over-consumption of refined carbohydrates and sugar promotes yet another biological pathway to aging, called advanced glycated end products (AGEs). AGEs not only damage the proteins making up the body, but they increase the rate of free radical production. Restricting calories results in fewer free radicals and fewer advanced glycated end products that age and damage our body. On the other hand, inadequate calories lead to malnutrition. Both increase the rate of aging. All forms of chronic disease and the "diseases of aging" appear to be postponed in time of onset and decreased in overall frequency by a reduced-calorie diet while ensuring optimum nutrients.

The most recent research suggests that calorie restriction may trigger certain genes that help manage your body's defenses during stressful times. Sirtuins, a family of genes that control an organism's ability to withstand hard times, may be master regulators of this survival mechanism. Sirtuins can cause changes throughout your body that render it temporarily revved up for survival. Activated over the long term, this stress response prolongs life span and forestalls disease in a wide range of organisms.

Calorie restriction acts like a biological stressor, like natural food scarcity, that induces a defensive response to boost the organism's chances of survival. Its effects include changes in cellular defenses and repair, energy production, and activation of programmed cell death.

The big question is whether it will work for humans. Most laboratory animals have relatively short lives compared to humans. This is a useful characteristic when researching maximum lifespan. However, it becomes problematic when testing theories

of longevity in species that live a long time, such as humans. It will take many decades, with a large enough population of people following a nutrient-rich but reduced-calorie diet to know how well it works in humans. However, we can get a clue to the potential effect of calorie restriction by observing the diets of certain populations known to have high life expectancy. Currently, the longest-lived people on earth are the Okinawans. One strongly supported theory for their longevity is based upon their traditionally low calorie, but nutritionally healthy diet. The traditional Okinawan consumes approximately 30% fewer calories than Americans!

Popularized by the research and writings of Roy Walford, MD, the calorie restricted 'lifestyle' has taken on a life of its own. A number of his followers, offering support, education and awareness about appropriate calorie restriction, formed the Calorie Restriction Society. The CR Society publishes basic guidelines for those wishing to begin a calorie-restricted diet (http://www.calorierestriction.org).

Our daily caloric requirements generally diminish as we age, by approximately 100 calories per decade after age 25, and nearly 10% per decade after age 50. Unfortunately, most of us continue eating habits established at a much younger age, thus consuming far more calories than we need. This in part explains why most adults gain weight with age. Thus, most people will lose weight with a calorie-restricted program. The temptation for many Americans is to lose it as quickly as possible. Research is clear that rapid weight loss has the unfortunate long-range outcome of even greater weight gain. Your body evolved to resist losing weight. Your metabolism is like a thermostat, which means your metabolism always tries to adjust itself so it only burns the exact amount of calories you need each day. Your metabolism burns calories based on your recent eating habits. Severely restricting your caloric intake will trigger your body to shut down metabolic processes to conserve energy. Your body will try to conserve body fat. This is why, after initially losing weight with a low calorie diet many people will notice the weight loss stops. The body has reset the thermostat.

To make matters worse, the body will ensure that energy is stored as fat, at the expense of many metabolic processes. When one quits a weight loss diet, and returns to eating his/her former number of calories, the body will try first to store the additional calories as fat, before turning up the metabolism again. This results in even greater weight gain than before dieting. Attempts at rapid weight loss fail to give sustainable results, and in the end promote the body to gain even more weight. Severe calorie restriction is definitely not the way to go.

A better, safer, and sustainable way is to lose body fat slowly, so the body's thermostat does not adjust itself so much that it stops burning fat for energy. In fact, research conducted with people following a reduced calorie diet shows the most effective and longest-lasting benefits accrue with a very gradual reduction in body fat somewhat below what is called your personal setpoint. Research points toward a setpoint for controlling both appetite and the amount of fat stored. Setpoint is hypothesized to work like a thermostat for body fat, maintaining fairly constant body weight. If body weight

decreases (as in dieting), the setpoint senses this change and triggers a mechanism to increase appetite or make the body conserve energy to maintain the “set” weight.

Every person has his or her own certain body fat percentage as established by the setpoint that the body attempts to maintain. It has been suggested that such a setpoint may be fixed by heredity and early feeding experience. The genetic instinct to survive tells the body that fat storage is vital, and therefore it sets an acceptable fat level. This level may remain somewhat constant or may climb gradually because of poor lifestyle habits and with increasing age.

Under strict calorie reduction, the body may make extreme metabolic adjustments in an effort to maintain its setpoint for fat. The basal metabolic rate, the lowest level of caloric intake necessary to sustain life, may drop dramatically when operating under a consistent negative caloric balance, and weight loss may plateau for days or even weeks. A low metabolic rate compounds a person’s problems in maintaining recommended body weight.

Dietary restrictions alone will not lower the setpoint, even thought you may lose weight and fat. When you go back to the normal or even below-normal caloric intake, you quickly regain the fat loss as your body tries to regain a comfortable fat store. The setpoint can be lowered with a combination of exercise and by avoiding diets high in fats (> 30%) and refined or high glycemic carbohydrates.

The goal of a calorie restricted diet is to reduce your weight (% body fat) slowly, approximately ½-1 pound per week, over a period of many months, until you reach, stabilize, and remain at a weight 10-25% below your personal set point percent of body fat, where set point is measured in pounds. A minimum percent body fat, below which one would begin to face an increased risk for disease, should be avoided. For an average healthy adult woman, the minimum body fat would be around 12 percent, and for men, around 8-10 percent. The chart shows suggested ideal body fat levels for highly fit individuals. (Higher body fat levels may be acceptable for less physically fit individuals)

Ideal High Physical Fitness Body Composition (% Body Fat)

Age	Male	Female
20-29	5-11	6-11
30-39	5-13	10-13
40-49	6-15	12-16
50-59	7-15	12-17
60+	8-16	12-18

While percent body fat is the optimal means of determining ideal body weight, a slightly less desirable alternative method is based simply upon gender, body frame size, and height. This approach begins by determining your body frame size.

Body Frame Size

(Measure non-dominant wrist circumference and smallest point)

Height (inches)	Small Frame	Medium Frame	Large Frame
Women			
< 62”	< 5.5”	5.5-5.75”	> 5.75”
62 – 65”	< 6”	6 – 6.25”	> 6.25”
> 65”	< 6.25”	6.25 – 6.5”	> 6.5”
Men			
> 65”	5.5 – 6.5”	6.5 – 7.5”	> 7.5”

Refer to the matching frame size for your gender on the next chart to find the optimal body weight for your height. The weight range is for an ideal calorie-restricted weight. If you are not reasonably well-conditioned physically (i.e., with less-than-optimal lean body mass), you may need to add 5%.

Optimal ‘Calorie-Restricted’ Weight

(Weigh without shoes, wearing indoor clothing)

Height (feet/inches)	Small Frame	Medium Frame	Large Frame
Women			
4’10”	97-105	104-115	112-125
4’11”	98-107	106-117	114-127
5’	99-109	108-120	116-130
5’1”	101-112	109-123	119-133
5’2”	103-115	112-125	121-136
5’3”	105-118	115-128	124-140
5’4”	108-121	118-131	127-143
5’5”	111-124	121-134	130-145
5’6”	118-126	124-137	133-151
5’7”	117-129	126-140	136-155
5’8”	120-132	129-143	139-159
5’9”	123-135	132-145	142-161
5’10”	125-138	135-148	144-164
5’11”	128-141	138-151	147-168
6’	131-143	140-154	150-170
Women 18-25: subtract 1 pound for each year under 25			
Men			
5’2”	122-127	125-134	131-143
5’3”	124-129	127-136	133-145
5’4”	125-131	128-138	135-148
5’5”	126-133	130-141	137-152
5’6”	129-135	132-143	139-156
5’7”	131-137	135-146	142-160
5’8”	133-140	138-149	145-163
5’9”	135-143	141-152	147-167
5’10”	138-146	143-155	150-171

5’11”	139-149	146-158	153-175
6’	142-152	149-162	156-179
6’1”	144-156	152-165	160-182
6’2”	147-160	156-169	163-187
6’3”	150-163	159-173	167-192
6’4”	154-168	162-178	172-197

Do not assume you could safely achieve this goal following a low-calorie but nutritionally poor or even mediocre diet, and then simply making up for the nutritional deficiencies of the food with supplement of vitamins and minerals. Merely eating less of the same old calorie-rich, nutrient-poor foods would certainly reduce your calorie intake, but it could also bring on malnutrition as a devastating side effect. This is a potential danger with many weight-loss diets. Nutritional supplementation has a definite place in a preventive-aging lifestyle, as described in the Targeted Nutritional Supplementation chapter, but nutrient-dense food selection is essential. Significant calorie reduction is probably not wise under the age of 30 years, as it may negatively affect growth, immune system function, bone density, etc.

Many people find it difficult to remain on a true calorie restricted diet, fighting feelings of constant hunger and frustration. A moderate approach to calorie restriction is preferable to the more severe calorie restriction used in animal research. Rather than giving up as many as 25-40% of your calories daily, it is possible to achieve most of the observed preventive-aging benefits with a more reasonable 15-25% calorie reduction. Moreover, it is likely to generate less frustration and constant hunger.

Daily Calorie Requirements

Your basal metabolic rate (BMR) is the basic minimum number of calories that are required to maintain your body weight (at rest) based on your body composition, and metabolism. However, basal metabolic rate does not take into account extremes of activity or inactivity. Therefore, basal metabolic rate is an approximation. Numerous factors affect metabolism, including hormone levels, activity, and lean body mass. Activity requires additional calories, so basal metabolic rate is multiplied by a number based on your activity level to determine your total daily calorie requirement. Generally, any additional calories above this level are stored as body fat, and fewer calories than this results in weight reduction. In other words, if intake exceeds output, you will gain weight, and vice versa. Moreover, if you take in more calories than you need, your energy efficiency drops, potentially to as low as 25%. That causes you to feel more sluggish and less sharp, and to tend to gain weight. On the other hand, if you take in slightly fewer calories than you need, your body will turn the energy efficiency up as high as 50%.

Fat is the most energy dense source of calories, providing 9 calories per gram. A pound of body fat can provide 3500 calories of energy. To oversimplify, if you want to lose 1 pound of fat per week, reduce your calorie intake below what you expend by 3500 calories per week. The difference will be made up from 1 pound of stored body fat by slowing metabolism. But, the body is programmed to conserve body fat. When you

reduce your metabolic rate, fewer calories are needed to maintain your weight. Excess calories are then stored as fat. It is also possible to consume too few calories; fewer than 1000-1200 calories per day for most women and 1200-1500 calories per day for most men, on a regular basis may reset your metabolic thermostat, lowering your basal metabolic rate. This is your body's way of defending you against what it believes is a famine. Moreover, calorie restriction below that which can be made up for from body fat risks catabolizing, or breaking down body tissue to provide protein calories to make up the difference (protein, like carbohydrates, contains 4 calories of energy per gram). In general, the body cannot safely burn more than about 2 pounds of body fat per week without losing fluid and protein. The ideal rate of body fat loss is around ½ to 1 pound per week. The two ways to increase basal metabolic rate are to be physically active, as activity raises BMR and keeps it up hours after the activity stops, and to build muscle tissue, as muscle burns more calories at rest than fat.

Determining Optimal Daily Calories

Once ideal body weight has been determined by either of the previously mentioned methods, calorie requirements are determined by adding the calories necessary to maintain body weight while at complete rest (basal/resting metabolic rate) to those required for daily activities and exercise.

Activity Levels

Activity levels indicate your normal daily routine. In most instances, it does not account for exercise, which is added separately. It is only concerned with what you do routinely every day. This is normally associated with your job.

- **Sedentary**
    - This is the classification that most people should be listed under. These are folks who sit down during the day to perform their jobs, walking occasionally. Most people who work at a desk are sedentary.
- **Moderately Active**
    - People who are on their feet during most of their work day are moderately active people. This would include occupations like waiters or waitresses.
    - Alternatively, people whose normal lifestyle is sedentary, but exercise equivalent to running 20 or more miles per week
- **Very Active**
    - These folks are very active, involving continual vigorous physical activity. They work in construction, move furniture, lift heavy loads, etc.
    - Alternatively, people whose lifestyle is sedentary but exercise equivalent to running 50 miles per week

Daily Calorie Requirement

Weight (lbs.)	Sedentary	Moderately Active	Very Active
90	1170	1350	1620
100	1300	1500	1800
110	1430	1650	1980
120	1560	1800	2160
130	1690	1950	2340
140	1820	2100	2520
150	1950	2250	2700
160	1080	2400	2880
170	2210	2550	3060
180	2340	2700	3240
190	2470	2850	3420
200	2600	3000	3600
210	2730	3150	3780
220	2860	3300	3960
230	2990	3450	4140
240	3120	3600	4320

We all have to eat a certain amount of food to feel comfortably full – usually between 2-3 pounds per day. If we eat less than that, we feel hunger pangs. So cutting back too much on the volume of food you eat is not the best approach to weight loss. A better approach is to eat the same amount of food but to choose low caloric density foods. You can calculate the calorie density of a food serving by dividing the calories by the grams. Low caloric-density foods include broth-based soups, vegetables, fruits, and legumes like soy, fat-free dairy products and very lean meats and fish. Limit consumption of the middle and high calorie density foods, including pasta, breads and bagels, crackers, chips, mayonnaise, doughnuts, bacon, hummus, beef, pork, cheese, nuts, and cookies.

Eat Slowly. Eat Less

One habit to help you stay energy efficient is to stop eating when you are 80% full. It could be argued that 80% of the accumulated excess body fat results from the last 20% (or so) calories we eat. Furthermore, it takes the stomach about 20 minutes to tell the brain it has filled to capacity, so by the time you feel full, you've already overeaten. Eating slowly allows the brain to catch up with what you eat.

Here, then, is the optimum nutritional lifestyle, based upon what science knows about the biological pathways of aging and the best elements found in the Paleolithic diet, the Mediterranean diet, and the nutrient-rich but calorie-restricted diet.

Optimum Nutritional Lifestyle

Optimum nutrition is not about low-fat meals, fat-free carbohydrates, low carbohydrates, or high protein regimens. These programs all have health risks because they increase markers for chronic inflammation. The key to successful aging is to understand that the foods you eat control your intricately connected and delicately balanced hormonal

system. Hormone levels and sensitivity change as you age and must be controlled to prevent or reduce silent and chronic inflammation.

Your optimum nutritional lifestyle incorporates the best elements of the Paleolithic diet, the Mediterranean diet, and the CRON (Calorie Restriction with Optimum Nutrition) diet. The sum, with a few modifications, is greater than the parts.

Macronutrients

Nutrients are substances necessary for proper bodily function. Some are required in large quantities (macronutrients) and some are required in small quantities (micronutrients). The macronutrients are comprised of carbohydrates, protein, fat, and water. All four make up an essential part of balanced nutrition. These macronutrients provide the fuel we need to live; we derive energy from the first three, measured in units of calories, for our bodies to function. Yet each macronutrient plays other unique and equally essential roles for our survival and good health.

Carbohydrates are composed of various forms of sugar, and provide the primary source of energy needed for our brain to operate - glucose. Amino acids are the building blocks of the proteins we need. All of our tissues and organs - from skin to blood vessels, nerves to organs - are built out of protein. Fats are essential for everything from cell wall integrity, to hormone production. Depending upon your age and health status, water comprises as much as 70% of your body weight. Small fluctuations in fluid balance can have major consequences to your health. The human body requires both an adequate supply and a balance amongst each of the macronutrients in order to grow and to function, and to avoid the pathological diseases of aging. The balance amongst carbohydrates, protein and fat is frequently represented as a ratio, or percentage.

Is there an ideal ratio for everyone? That simple question has prompted the writing of dozens of books, each suggesting a different ratio required for humans. Research has not provided a definitive answer to this question. If there is anything we can learn from the current research and the continued proliferation of advice on this subject, it is that not one ratio is right for everyone. This partly explains why some people will swear by a particular diet and others curse it. The fact of the matter is there is not even a ratio that is right for the same person throughout his or her life. Individual needs change, depending on age, current state of health, lean and fat body mass, gender, activity levels, health or fitness objectives, medications, stress levels, genetics, etc. A new specialty, nutritional genomics, may offer a definitive answer for each one of us sometime in the next ten years. The goal of nutritional genomics is to determine, from a DNA analysis, exactly what you and I should eat based on an individual's genetics. We may learn what to eat more of and what to avoid or reduce in our diet, based on a genetic profile. We are not yet at that point. Until then we rely on a combination of epidemiologic evidence, in vitro studies and clinical trials. Research into the diet of our Paleolithic ancestors offers additional clues. From this, we have a good idea of what is known to work for the majority of people and how aging-related diseases are impacted by nutrition.

Macronutrient	Institute of Medicine Guideline	Optimum Intake
Carbohydrates	45-65% (sugars, 25%)	40-50% (sugars < 15%)
Protein	10-35%	25-30%
Fat	20-35% (saturated fats <= 10% of total calories)	20-30% (Saturated fats < 5% of calories)
Fiber		
Age < 50		
Female	25	> 30
Male	38	> 40
Age >50		
Female	21	> 25
Male	30	> 30
Benefits are optimized when these ratios are adhered to with each meal and snack		

There is yet another macronutrient ratio that deserves mentioning – the ratio of protein to carbohydrate during a single meal. The ratio of protein to carbohydrates consumed with each meal plays an important role in the resulting blood levels of an essential hormone – insulin. Carbohydrates stimulate the pancreas to release the storage hormone insulin. Insulin's purpose is for transporting the digested carbohydrate (sugar) to cells for energy or for storage as fat. The more carbohydrates consumed during a meal, especially the refined kind, the more insulin is secreted into the blood stream. The body is very sensitive to the level of glucose in the blood, and attempts to maintain a steady state. Not enough, and the brain is unable to function properly. Too much and you gain weight and accelerate the processes of aging. Likewise, too much of the hormone insulin creates its own problems.

Protein, on the other hand, has little impact on insulin levels. Instead, it has a tendency to promote release of another hormone, glucagon, into the blood. Glucagon tends to elevate blood sugar. Some studies have found that maintaining the ratio of protein to carbohydrate in the neighborhood of 0.5 to 1.0 with each meal minimize the elevation and subsequent decline of insulin levels in the blood following a meal. In other words, the number of protein calories in a meal might be anywhere from half as many calories as those you obtain from your carbohydrates, up to a maximum of equal quantities of protein and carbohydrate. Where within this range is optimum varies not only from one person to another, but at different times for the same person, as mentioned previously for the ratio of carbohydrates, protein and fat. The take-home point is to get some carbohydrate and some protein together with every meal or snack.

Carbohydrates

Carbohydrates, found in plant sources such as fruits, vegetables, and grains, are utilized for energy, both instant and sustained. The main job of carbohydrates is to provide immediate energy and short-term energy storage as glycogen in the liver and muscles. Carbohydrates are the first place your body goes when it needs energy. Excess carbohydrates are burned off as heat. When insufficient carbohydrates are taken in, the body must utilize proteins for energy even to the point of catabolizing

(breaking down) muscle tissue for energy. Ideally, carbohydrates should comprise 40-50% of your daily calories (40% is a good starting point for most adults).

Digestive enzymes in the small intestines break down the carbohydrates into glucose. The glucose can be immediately utilized by the body or stored as glycogen in the muscles and liver. The muscles can store about 20 minutes of glycogen for energy. The bloodstream can hold about an hour of glucose for energy. If glucose levels are maximized and all glycogen storage locations are full then any excess glucose is converted to fat by the liver and stored in adipose tissue or fat cells. There is really no limit to the amount of fat the body can store.

There are three types of carbohydrates: monosaccharides, disaccharides, and polysaccharides. Monosaccharides are simple sugars and are the basic unit of carbohydrates. Examples of monosaccharides are glucose and fructose. Disaccharides are composed of two monosaccharides. Examples of disaccharides are table sugar (sucrose), and milk sugar (lactose). Polysaccharides are composed of multiple monosaccharides. Examples of polysaccharides are starches (bread, fruit, grain, pasta, rice). One gram of carbohydrate contains 4 calories of energy, regardless of the carbohydrate type.
Alcohol is not a carbohydrate, but is often compared with carbohydrate calories. This is a mistake. First, no nutritional benefit is derived from alcohol. Second, alcohol is far more energy dense than carbohydrates, each gram containing 7 calories, which is almost as energy dense as fat (which has 9 calories per gram). In addition, alcohol temporarily slows down the metabolism. The effect of this is that less fat is burned. Moreover, high-fat foods are frequently consumed with alcohol, which makes matters worse. Also, alcohol inhibits the liver from metabolizing fat. Alcohol also interferes with estrogen metabolism and causes almost an immediate hormone imbalance, increasing estrogen in the blood relative to progesterone.

Simple, refined carbohydrates comprise the bulk of carbohydrates in the typical American diet - sugar, refined bread and cereals. Today, nearly 30 percent of daily caloric intake in the U.S. comes from sugar. Most Americans fail to consume the needed 6-10 daily servings of fruits and vegetables, the preferred source of more complex and nutrient-rich carbohydrates. Sadly, the average daily consumption is no more than 3.3 servings. Variety is equally lacking. Nearly half of the vegetable servings eaten by Americans come from two nutritionally weak foods - head lettuce (usually iceberg) and potatoes (frequently as chips, fries, or hash browns).

We have come to think of carbohydrates as comfort food, because they give our body and mind a rapid, albeit short-lived, sense of well-being. All carbohydrates stimulate the body's production of insulin. While you need some insulin, too much insulin has many toxic effects. Excess insulin makes you fat and keeps you fat (insulin is a storage hormone), accelerates the aging process and increases your risk for chronic disease. Your goal is to keep your insulin level within an optimal low range that is neither too high nor too low. You should consume carbohydrates at every meal, however the carbohydrates you choose (simple versus complex), along with a sufficient amount of

protein, determines how much insulin is secreted and how well the body performs for the next 4-6 hours.

Not all carbohydrates have the same effect on insulin levels. Glycemic Index (GI) is an index of how rapidly various carbohydrate-containing foods tend to raise blood sugar levels. Glycemic Index provides a means to compare the relative impact on insulin levels of one carbohydrate to another. The higher the GI the greater the effect on blood sugar, and subsequent insulin levels. Eating too many high GI carbohydrates raises triglyceride levels in the blood. Foods naturally low in carbohydrates such as meats, seeds, fats and most dairy products have minimal effect on raising blood sugar and insulin levels. The majority of carbohydrates you consume should come from among those with the lowest Glycemic index, such as fruits and vegetables. Most vegetables and fruits are sources of low-density carbohydrates that do not enter the bloodstream rapidly and spike insulin levels. This means you can consume large quantities of vegetables and fruits without overproducing insulin. Most adults should strive for 8-10 combined servings of fruits and vegetables daily (5-7 vegetables and 1-3 fruits). On the other hand, if you limit your carbohydrates exclusively to those with a low glycemic index, you may miss out on important micronutrients. A few of your carbohydrates will include those with a higher glycemic index as well.

Grains and starches (pasta, breads, bagels, potatoes, and cereal) are called high-density carbohydrates, meaning they are loaded with calories for a given weight or volume. They enter the bloodstream relatively quickly, and even small amounts can elevate insulin levels. Carbohydrate sensitive individuals may find that eating whole grain products triggers binge eating. Short chain carbohydrates are sweet and are likely to promote over-consumption. Unfortunately, the total sugar intake for the average American has increased 25-fold during the past few hundred years. Today, approximately 25-30% of the calories consumed by the average American come from sugar. Restrict your high-density carbohydrates to very small quantities compared to low-density carbohydrates. We did not evolve requiring grains, so you can limit them to no more than 1 or 2 servings per day (or none), and when you do consume grains choose whole grains. This includes pasta, bread, cereals, and rice. Because of the fiber they contain, whole grains enter the bloodstream somewhat more slowly than refined grains.

High and Low Glycemic Index Foods			
Glucose	100	Spaghetti	50
Corn flakes	80	Oatmeal	49
White rice	72	Sweet potato	48
Whole wheat bread	72	Orange	40
Potato	70	Apple	39
White bread	69	Milk (skim)	32
Shredded wheat	67	Lentils	29
Brown rice	66	Kidney beans	29
Banana (ripe)	62	Barley	25

The Glycemic Load (GL) is a more sophisticated measure than glycemic index. Glycemic Load measures the relative impact of the glycemic index for a food, by factoring in the unit weight of the food. While the carbohydrate in a food may have the ability to raise insulin levels rapidly, thus ending up with a high Glycemic index, it may actually have little real impact if it makes up a small amount of the food serving per unit of weight. The lower the glycemic load of a food, the less it will raise insulin levels. An example can be found with the carrot. Carrots have a relatively high Glycemic index, especially compared to most vegetables. However, because the carrot is made largely of fiber and water, the total quantity of high glycemic carbohydrate in the carrot is relatively low. Eating a carrot, then, should have less impact on insulin levels than a food with a lower glycemic index but a higher glycemic load. For example, white bread has essentially the same glycemic index as a carrot, yet the glycemic load for white bread is six times greater.

High Glycemic Load		
Food	**Glycemic Index**	**Glycemic Load**
Instant rice	91	24.8
Baked potato	85	20.3
Corn flakes	84	21.0
White bread	70	21.0
Rye bread	65	19.5
Banana	53	13.3
Lower Glycemic Load		
	Glycemic Index	**Glycemic Load**
Spaghetti	41	16.4
Carrot	71	3.8
Apple	36	8.1
Lentils	29	5.7
Milk	27	3.2
Peanuts	14	0.7
Broccoli	negligible	negligible

Source: Life Extension Foundation

Fiber

Dietary fiber is a type of carbohydrate. It is the part of plant-based food that you don't digest. Even though fiber is a carbohydrate, because it doesn't digest it provides no calories. Foods high in fiber include fruits and vegetables, oatmeal, oat bran, beans and other legumes, and brown rice. While fiber is not absorbed, the health benefits of a high fiber diet are well established. A number of diseases have been purportedly associated with low-fiber diets:

- Metabolic – Obesity, gout, diabetes, kidney stones, gallstones
- Cardiovascular – Hypertension, cerebrovascular disease, ischemic heart disease, varicose veins, deep vein thrombosis, pulmonary embolism
- Gastrointestinal – Constipation, diverticulitis, Diverticulosis, hemorrhoids, colon cancer, irritable bowel syndrome ulcerative colitis, Crohn's disease
- Other – Dental caries, autoimmune disorders, pernicious anemia, multiple

sclerosis, thyrotoxicosis, dermatological conditions

Fiber comes in two forms: soluble and insoluble. Both are necessary. Soluble fiber (e.g., psyllium) slows empting of the stomach and helps us feel full, making it easier to control weight. If you eat 35 grams of fiber daily that, in effect, might replace as much as 160 calories a day because fiber slows down your digestion, so you feel full longer and are less likely to overeat. Soluble fiber's ability to slow down absorption of food can dull some of the rapid effects of high glycemic carbohydrates on raising insulin levels. Eating soluble fiber along with a high glycemic carbohydrate will slow the absorption of the carbohydrate, effectively lowering the glycemic index. Moreover, soluble fiber has been found to reduce the absorption of cholesterol and improve serum lipid levels. In general, plant-based fiber is richer in soluble fiber and is better at reducing cholesterol than grain sources.

Insoluble fiber (e.g., wheat bran), frequently called dietary fiber on the Nutrition Facts found on food packages, bulks up your stool by absorbing and retaining water. It shortens the transit time of food through the gut, possibly reducing the incidence of colon and other cancers. Bulkier, faster-moving stool relieves or prevents all kinds of intestinal problems, including constipation, hemorrhoids, irritable bowel syndrome, and perhaps even gallstones. The association between diets rich in whole grains and reductions in coronary heart disease is most likely due to the fiber content in whole grain.
Most Americans consume 12-15 grams of fiber daily, only about half or less of what is optimum. The optimum amount for most adults is somewhere around 25-50 grams daily. Many authorities suggest as much as 60 grams daily would be better yet. A diet consisting of 8-12 servings of fruits and vegetables daily, along with limited whole grains, will generally provide the optimum amount of fiber. When you are looking for whole grains, try to select those that provide at least 4 grams of fiber per serving. When it is not possible to obtain adequate quantities of fiber from your diet alone, fiber supplementation is easy, readily available and inexpensive.

Protein
Proteins are the basic structure of all living cells. Proteins are used in making hormones, blood plasma transport systems, and enzymes. Protein should provide 25-30% of your daily calories. The basic building blocks of proteins are called amino acids. There are two types of proteins: complete and incomplete. Amino acids are categorized as essential and nonessential. Of the 20 amino acids that have been identified, nine are considered essential amino acids, those that are not manufactured by the body and must come from dietary intake. Proteins that contain all nine essential amino acids in sufficient quantity to sustain life are called complete proteins. Too little protein can lead to malnutrition and wasting of tissue; too much can lead to arterial damage, high blood pressure and kidney stones.

Protein is rated according to various indices, the most common being the Biological Value of the protein. The higher the biological value, the more readily the protein is absorbed by the body. Eggs have the highest biological value of 100. Whey proteins

value is close to 100 while beans have a biological value of 49.

Meat, fish, soy, milk, cheese and eggs contain complete proteins. Incomplete proteins such as vegetables, grains, seeds, and nuts are those which do not contain all nine essential amino acids by themselves. However, combinations of incomplete protein foods or nutritional supplementation can supply all nine essential amino acids. Other protein comes from the recycling of enzymes and other proteins. Protein is synthesized in all tissue in the body; however, the liver and muscles are the most active.

Protein digestion begins in the stomach, but is primarily digested in the small intestine and metabolized by the liver for the building of tissue. About 98% of the protein from animal sources and about 80% of the protein from vegetable sources is absorbed by the body. Proteins not required for building can be utilized as an energy source and can provide 4 calories per gram.

Aging reduces the ability to digest and absorb protein. Animal protein becomes more difficult to digest than many plant sources of protein. Moreover, with advancing age, most people consume smaller amounts of protein. Many aging adults end up in a state of negative protein balance, making it important to ensure adequate protein intake. Concerns about overloading the kidneys with too much protein are not a risk for most adults with adequate kidney function. However, very high protein intake (> 35% of daily calories), found in many high protein diets, is not recommended.
Protein must be consumed daily to replenish the protein constantly lost through normal body functions. It is essential for proper immune function, muscle strength, and it helps maintain and regulate every cell in your body. The important thing to remember is that you must eat adequate protein throughout the day. When restricting calories, getting enough protein is essential for preserving your muscle tissue. Hair loss and thinning, as well as brittle and discolored fingernails can be external manifestations of protein deficiencies. Internal ramifications can be muscle wasting, weak ligaments and cellular dysfunction, since amino acids will be in short supply. Muscle growth will also be limited or unavailable due to an insufficient amount of protein.

Protein foods come from animals and plants. Getting proteins from vegetable sources such as soy is important. Over-consumption of the amino acid methionine, a byproduct of animal sources – mostly meat – can result in high levels of homocysteine. Plant proteins have very low levels of methionine. Optimal sources of animal protein include fish, wild game, and egg whites. Protein powders (whey, soy, egg-white, and rice) are acceptable, as they contain only negligible quantities of growth hormones, antibiotics, and no saturated fats or arachidonic acid. Organic, free-range, grain-free poultry (skinless white meat) is acceptable. All other poultry today contains as much saturated fat as most beef. Dairy products should be consumed in limited quantity, and only in a fat-free variety, such as fat-free cottage cheese. Caution with yogurt (even fat-free) as a protein source, as it is often loaded with sugar.

Here is a simple rule-of-thumb for selecting animal sources of protein: If it runs (wild game), flies (poultry) or swims (fish) it is likely a good source of protein. Cows and pigs

are animals that generally do none of the above activities (I have never seen a pig fly), and should be consumed rarely, if at all. Another piece of wisdom advises against eating meat from an animal with more than two legs. Fish have no legs. Poultry, emus and ostrich have two legs. Cows and pigs would then be excluded. Meats, such as steak, bacon and sausage contain saturated fat, which should be kept to an absolute minimum (saturated fat < 5% of total daily calories). Red meat consumption should be limited to 0-2 servings per month. Organic, open range, 100% grass-fed beef can be consumed once per week. If you decide to eat bacon, consider turkey bacon (organic, and free of hormones, nitrates, and antibiotics). Chicken sausage may be a better bet than pork sausage.

Protein metabolism produces nitrogen in the body. This creates an extra workload for the kidneys and liver to eliminate the excess. Dehydration can result because the kidneys require increased amounts of water to dilute the nitrogen. Therefore, protein consumption should be limited to no more than 30% of your total daily calories. Additionally, it's important to adequately hydrate well when consuming optimum levels of protein.

Here is a list of various sources of protein

- Ideal (May consume regularly)
    - Fish – at least 3-6 servings per week. Refer to the guide at the end of this chapter for safe fish selections
    - Eggs and egg whites. While the cholesterol in egg yolks is not a major concern for most adults with normal lipids, the yolk contains saturated fat and is rich in the pro-inflammatory omega-6 fatty acid arachidonic acid
    - Lean organic, free-range chicken and turkey (skinless white meat)
    - Soy
- Acceptable (May consume a few times per week)
    - Fat-free, organic dairy products
    - Wild game, e.g., venison, buffalo, emus, ostrich
    - Lean cuts of organic, open range, 100% grass-fed beef
    - Beans and legumes
- Not Recommended (Less than once per month or avoid completely)
    - Processed meat
    - Grain-fed, non-organically raised beef, pork, poultry
    - Low-fat and full-fat dairy products
    - Bacon, sausage, ham, smoked meats
    - Meats cooked at very high temperatures (grilled, fried)

Hidden Problems with Beef and Pork

Three additional risks associated with eating meat are worth noting: the food source, hormone administration, and antibiotics. Today, common practice is to fatten cows with grain rather than grass. Unfortunately, the consequence is meat rich in omega-6 compared to omega-3 fatty acids, which tips the scales toward an imbalanced production of pro-inflammatory hormones in your body (the same thing happens when humans eat grains – obesity and elevated omega-6 levels). Grass-fed beef, on the

other hand, has a ratio of omega-6 to omega-3 that is much closer to that found in free-range poultry. If the label does not specify that the beef was 100% grass-fed, then you should assume it has a high omega-6 to omega-3 ratio.

The second risk comes from supplementing beef, pigs, and poultry with growth hormones. Hormones stimulate growth and increased milk production in cows. Some of the hormone remains in the meat and milk we consume. The ingestion of these foreign hormones, xenohormones, is likely a contributing factor to adverse health effects in humans – from earlier sexual and physical development in young people, to an increased incidence of hormone-related cancers, such as breast and prostate cancer.

The third risk with modern dairy practices involves the use of antibiotics. The administration of hormones to dairy cows results in significantly greater milk production. Because the cow is producing so much more milk their udder becomes so grossly enlarged that the teats literally drag on the ground, constantly exposing them to bacteria. To avoid infected udders antibiotics are added to the feed. A small portion of the antibiotics end up in the meat and milk we consume. Constant exposure to antibiotics has been associated with mutations of bacteria to become resistant to antibiotics, and recently it has been observed that women with long-term antibiotic exposure are at greater risk for developing breast cancer. Could the same thing be true for men with prostate cancer? We don't know yet, but it may not be worth risking.

The Plant-Based Protein Alternatives

Excellent alternatives to animal and fish protein are plant-based protein sources. Soybean products are an excellent example of a plant-based protein. Soybeans are a member of the legume family. They are the highest-quality plant protein – containing all essential amino acids, low in saturated fat, and no cholesterol. Common sources of soybean protein include soymilk, soy nuts, tofu, Miso paste, boiled soybeans, green soybeans called edamame, and soy flour (preferably the defatted soy flour). The less processed the soy the better. Soy is available as an alternative to meat and cheese, such as soy burgers and soy sausages. Soy is also available in a protein powder.

Asian cultures have used soy extensively for centuries. Older Okinawans, the longest living people in the world, have among the highest consumption of soy in the world, 60-120 grams daily. On the other hand, Americans typically eat less than 5 grams of soy daily. Soy contains antioxidant flavonoids, and other healthful phytonutrients. Soy, containing saponins, has been shown to significantly lower cholesterol. The American Heart Association recommends at least 25 grams of soy protein daily as part of a heart-healthy diet. The Journal of the American Medical Association reported in July 2003, that a diet of soy protein, protein from oats and barley, almonds and margarine from plant sterols lowered cholesterol as much as statins, the most widely prescribed cholesterol medication. Some women also find that soy helps them manage hot flashes and other symptoms of menopause. Asian cultures, where soy consumption in the diet is high, have a much lower incidence of both breast and prostate cancers. It is generally believed that soy reduces the occurrence of these hormone-related cancers. Protein powders can supplement the diet, such as whey, soy, egg white, and rice

protein. Whey is more ‘anabolic’ than soy protein, and may maintain and build muscle a little more effectively than soy. Rice protein is a good protein alternative if you have food sensitivities.

Protein exerts a greater suppressive effect on appetite than any other macronutrient. Protein digests slowly and has very low calorie density, which triggers satiety. It is a more satiating macronutrient than carbohydrate.

When it is not possible to measure the quantity of protein in your meal, you may estimate it as follows. As a rule, eat a portion of protein about the size and thickness of the palm of your hand at every meal.

Fats

Fat is required for the production of cell membranes, blood lipids (body fat), bile (fat emulsifier), steroids and vitamin D. The transport and absorption of fat-soluble vitamins utilizes fat. The absorption of vitamins A, D, E, and K is dependent on fat. Fat is a necessary component of cell wall structure and integrity. Numerous hormones are made from various fats. Body fat is also instrumental in body temperature regulation as insulation.

Fats are digested by the enzyme lipase in the small intestines with the assistance of bile salt emulsifiers. They are then transported through the bloodstream with the assistance of lipoproteins (fat + protein coating + phospholipids) and stored as triglycerides (glycerol + three particles of fatty acids) in fat cells. When energy is required, fats are then released into the bloodstream as fatty acids. The fatty acids travel through the bloodstream and combine with glucose to burn the combination as energy. A combination of fatty acids and glucose is necessary for aerobic energy production. The anaerobic system uses mainly glucose and phosphagen, which is limited in its ability to produce energy. Further, lactic acid is one of the byproducts causing the burning sensation after a hard workout. Inadequate carbohydrate availability will result in incomplete fat metabolism producing unused lipids called ketones and leading to a chemical imbalance in the blood known as ketosis. Organ and muscle tissue may be metabolized to produce glucose from the breakdown of protein. Most of the weight loss that occurs by severe carbohydrate restricted diets is from water loss as the kidneys attempt to rid the body of the ketones.

We declared a war on dietary fat in the 1980s and 1990s, believing it was the culprit in the growing obesity problem this country began experiencing. The low fat diet craze was well intentioned but many people "threw out the baby with the bath-water" – most people reduced omega-3 fat intake as well as other fats, and increased omega-6 fats. However, fat, per se, is not the enemy. Fat is essential to our survival and health. The key is not eliminating fat from the diet, but in consuming the right kind of fats in the correct ratios. The three kinds of fat are saturated, polyunsaturated, and monounsaturated.

Mono- and polyunsaturated fats are fats not produced by the body. Therefore, they must be consumed in the diet or taken as a nutritional supplement. Two essential polyunsaturated fatty acids are omega-3 and omega-6. Omega-3 is often deficient because it is found in limited amounts in most foods. The richest sources of omega-3 are fatty fish and fish oil, walnuts and other tree nuts, pumpkin seeds, and flaxseed oil. Omega-6, on the other hand, is very plentiful in foods, such as vegetable oils (sunflower, sesame, safflower, olive, and corn oils). Numerous biochemical processes depend upon both omega-3 and omega-6. Optimum health depends on a sufficient quantity of each one, and the ratio must be kept in balance.

Long-chain omega-3 fats are critically important to help prevent chronic inflammation, and for improved cardiovascular and brain function. Numerous studies have shown that omega-3 fatty acids can reduce triglycerides, help regulate the immune system, influence neurotransmitters, lower blood pressure, decrease inflammation, prevent heart arrhythmias and reduce cardiac events, reduce the risk for certain cancers such as prostate cancer and melanoma, and improve mood. They even turn some gene expression on and off. Omega-3s can reduce sun-related skin damage from sunburn, a leading cause of wrinkles. Because they slow digestion, omega-3 fatty acids affect satiety and stabilize blood sugar levels.

Eating a diet high in omega-3 fatty acids (and soy) may help your brain fight the destructive plaque associated with Alzheimer's disease, according to research published in The Journal of Neuroscience in 2004. The study showed that omega-3 stimulated production of the protein known as insulin-degrading enzyme (IDE). Researchers found that IDE might help destroy the amyloid peptides that cause destructive plaque in the brain. Brain tissue from Alzheimer’s patients has lower than normal levels of IDE protein. This may also help explain why people with type-2 diabetes are more likely to develop Alzheimer's disease, due their lack of this protein.

Omega-3 fatty acids are metabolized further into two other fatty acids - eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) - found predominantly in cold-water fish like salmon, albacore tuna, halibut, herring, mackerel, and sardines. They are also present in lesser amounts in canola oil, soybeans, and walnuts.

Long-chain Omega-3 fats should be included as part of your daily diet and supplemented with pharmaceutical-grade fish oil concentrates. Humans evolved consuming a nearly equal ratio of omega-3 to omega-6 fatty acids, a delicate balance that affects our entire life. Years ago, people got omega-3 from grass-fed beef, game meats, leafy greens, and especially fish. Today’s fast food and processed foods nearly eliminate omega-3s from the diet. Instead, they contain large amounts of omega-6. The typical American diet provides a ratio of omega-6 to omega-3 that exceeds 20:1.

It isn’t only the quantity of one or the other entirely, but also the ratio between the two that tips the scale in favor of an imbalance in eicosanoid hormones favoring inflammation, vasoconstriction of arteries and blood clotting. Too many omega-6s promote inflammation and disease. Survival and good health depend on the ability to

mount an inflammatory response and have the ability to constrict arteries and clot blood, just not too much or continuously. A U.S. Surgeon General report stated that imbalances in fats and too many fats are involved in up to 70 percent of all deaths in the U.S. Fifty percent of sudden cardiac deaths occur in people who have 'normal' cholesterol levels. An unfavorable balance of omega-6 to omega-3 fatty acids is a major underlying cause. A favorable balance of omega-3 is necessary to prevent inflammation and inflammatory-based diseases, and to prevent many cancers, pain, neurological dysfunction and neurodegenerative diseases.

While monounsaturated fats and long-chain Omega-3 fats are the preferred fat choices, some other fats should be avoided whenever possible. Linked to increased LDL cholesterol levels, saturated fat is found in animal products (red meat and dairy products), coconut, and palm oil. Current medical wisdom favors a distribution of fats where saturated fat comprises fewer than10% or our total daily caloric intake, 10% polyunsaturated (the omega-3s fall in this category), and the remainder monounsaturated. I recommend no more than 5% of your calories come from saturated fat.

The most dangerous of all are the "trans" fats, found in virtually all processed food. Trans- fats are created from polyunsaturated fats during the partial hydrogenation process that converts liquid oil into solid fats. Hydrogenation is performed to permit longer shelf life, but omega-3 fatty acids are destroyed during partial hydrogenation. Any ingredient listing with the words "partially hydrogenated vegetable oils" contains "trans" fats. While these unnatural fats make foods more stable, they also increase the risk of heart disease.

Found in fatty red meats, egg yolks, and organ foods (like liver) is yet another potentially harmful fat - arachidonic acid. This polyunsaturated fat is used along with protein in cell membranes. When needed, this fatty acid is converted into a group of chemicals that regulate blood pressure, contractions and childbirth, blood clotting, peristalsis, and the immune system. When consumed in excess, however, it is deadly. Arachidonic acid is a potent stimulator of insulin secretion and the production of inflammatory eicosanoid hormones. Excess levels of arachidonic acid in the body are a major cause of chronic inflammation. We were taught to avoid eggs many years ago for fear that the cholesterol in the yolk would raise blood cholesterol levels. We now know that dietary consumption of cholesterol comprises only about 10-20% of the source for blood cholesterol. The body manufactures the rest. However, there is a more important reason to avoid regular consumption of egg yolks - they are rich in arachidonic acid.

Non-steroidal anti-inflammatory drugs (NSAIDs) are widely used to reduce arthritic pain by decreasing painful inflammation. Inflammation is caused by an overproduction of a class of eicosanoids hormones that promote inflammation, such as interleukin-6, and various prostaglandins. NSAIDs attempt to block these inflammatory hormones. Arachidonic acid is required to produce those same inflammatory hormones. It makes sense, then, that any dietary reduction of excessive arachidonic acid will result in fewer inflammatory hormones. If you want to reduce inflammation, change your diet before

reaching for the NSAIDs.

Fat induces the release of a hormone called cholecystokinin. Cholecystokinin sends a signal to the brain that you are full, and acts as a brake on insulin production by slowing down carbohydrate entry into the bloodstream. Good fats, especially monounsaturated fats (found in foods such as olive oil, almonds, avocados, canola oil) have no direct effect on insulin, and provide cardiovascular benefits.

We recommend that your total fat intake comprise no more than 25-30% of your daily calories, if 80-85% of the fat calories are comprised of monounsaturated fats and omega-3 fatty acids. In some instances, you may be advised to reduce the percentage of fat in your diet to as low as 20%, to treat various lipid disorders or diseases. Diets consisting of fewer than 20% fat run a risk of interfering with the absorption of fat-soluble vitamins and other beneficial phytochemicals derived from plants.

Not all so-called Mediterranean foods should be included as a frequent part of your diet. Many high-fat dishes and rich desserts, like lasagna and tiramisu, have become even less healthy in America. Originally, these dishes were special occasion treats. Moreover, although your recommended diet does feature olive oil as the main source of fat, the large quantities of fat consumed in the traditional Mediterranean diet are reduced.

Percentage of Specific Types of Fat in Common Oils and Fats*				
Oils	**Saturated**	**Mono-unsaturated**	**Poly-unsaturated**	**Trans**
Canola	7	58	29	0
Safflower	9	12	74	0
Sunflower	10	20	66	0
Corn	13	24	60	0
Olive	13	72	8	0
Soybean	16	44	37	0
Peanut	17	49	32	0
Palm	50	37	10	0
Coconut	87	6	2	0
Cooking Fats				
Shortening	22	29	29	18
Lard	39	44	11	1
Butter	60	26	5	5
Margarine/Spreads				
70% Soybean Oil, Stick	18	2	29	23

67% Corn & Soybean Oil Spread, Tub	16	27	44	11
48% Soybean Oil Spread, Tub	17	24	49	8
60% Sunflower, Soybean, and Canola Oil Spread, Tub	18	22	54	5
*Values expressed as percent of total fat; data are from analyses at Harvard School of Public Health Lipid Laboratory and U.S.D.A. publications.				

Percentage of Calories from Fat and Amount of Omega-3 Fatty Acids in Different Fishes

Low-fat Dishes

Species	% Calories from fat	Omega-3 gm/4 oz.
Haddock	7	0.2
Cod	8	0.3
Crab	7	0.3
Pike	9	0.2
Sole	0	0.3
Tuna, light, in water	10	0.2
Red snapper	11	0.4

Percentage of Calories from Fat and Amount of Omega-3 Fatty Acids in Different Fishes

Medium-fat Dishes

Species	% Calories from fat	Omega-3 gm/4 oz.
Flounder	13	0.3
Rockfish	14	0.6
Tuna, white, albacore	14	0.5
Halibut (Atlantic)	17	1.0
Halibut (Pacific)	23	0.6
Ocean Perch		0.3

High-fat Dishes

Species	% Calories from fat	Omega-3 gm/4 oz.
Catfish	30	0.7
Sardines	55	>1.0
Trout, rainbow	37	>1.0
Shark	33	>1.0
Salmon, pink, King, Coho	36	2.2
Salmon, sockeye, canned	36	1.8
Herring	43	1.3
Mackerel	52	2.5
Salmon, Chinook	58	3.0

Cholesterol belongs to the same chemical family as steroids and is related to fat. It is important for the production of cell membranes, myelin sheaths around nerves, sex hormones, bile, and vitamin D. Dietary cholesterol is the cholesterol consumed from the diet. Blood serum cholesterol is the amount of cholesterol circulating in the bloodstream. The two are not closely related. Some people consume large quantities of dietary cholesterol and have a low serum cholesterol level. Conversely, some people have high serum levels and consume very little dietary cholesterol. Conversion from dietary to blood serum cholesterol varies for each person and ranges from 20% to 90% of the amount consumed.

Basically, there are two types of cholesterol transport systems, low-density lipoproteins (LDL) and high density lipoproteins (HDL). Each type is a fat carrying protein. LDL, or "bad" cholesterol carrier, transports cholesterol to the cells and is associated with arteriosclerosis or hardening of the arterial walls. HDL, the "good" cholesterol carrier, transports cholesterol to the liver where it is processed for excretion or broken down for other uses. Monounsaturated and polyunsaturated fats lower LDL levels and increase HDL, whereas saturated fats increase LDL levels. Limiting your dietary cholesterol intake to 150 mg may reduce total cholesterol levels further.

Type of Fat	Sources	Effects on Cholesterol
Monounsaturated	Almonds, Avocados, Canola oil, Flaxseeds/oil, Olives/oil, Peanuts/oil, cashews	Lowers LDL Raises HDL
Polyunsaturated		
Omega-3	Borage oil, Canola oil, Fish oil, Flaxseeds/oil, Grapeseed oil, Pumpkin seeds, Fish, Walnuts	Lowers LDL Raises HDL
Omega-6	Corn oil, Cottonseed oil, Grapeseed oil, Poultry, Safflower oil, Soybean oil, Sunflower oil	Lowers LDL Raises HDL
Saturated	Animal fat, Butter, Cocoa butter, Coconuts, Coconut milk/oil, Margarine, Palm oil, Red meat, Whole dairy products, Chocolate	Raises LDL Raises HDL
Trans	Cookies, Deep-fried foods (esp. French fries), Many fast foods, Vegetable shortening, Hydrogenated and partially hydrogenated oils, Most margarines, Pastries, Pies, Most commercial baked goods	Raises LDL Lowers HDL

Water

Water emulsifies solutions within the body and transports them to the various tissues including the transport of waste byproducts. Additionally, water is essential for all energy production in the body. Water is also used for temperature regulation, waste elimination, and is essential to cell processes. Water helps the body eliminate the breakdown products of fat. An inadequate supply of water can result in up to a 30% reduction of energy. Insufficient water in the body results in a decrease of blood volume thereby reducing the overall oxygen transport ability of the blood to properly supply the muscles during exercise. Since blood is used to regulate body temperature, inadequate cooling of the body occurs. The heart rate increases as the cardiovascular system is stressed and overheating occurs, leading to possible heatstroke or heat exhaustion. We can survive without other nutrients for several weeks. However, we can only survive without water for about one week.

No matter where you go today people are carrying bottled water – to church, in the board room, in the car. You never have to worry about water not being available, now that it is bottled and sold, albeit at exorbitant prices. Consuming enough should be easy. We are comprised mainly of water and water is required for hundreds of cell and organ functions. The irony is that most of us do not drink enough fluids today.

Have you ever noticed how children are always asking for a drink of water, and older people are much less likely to do so? Nature gave us the means to monitor the state of our hydration. When we were young, our thirst sensors were very sensitive and let us know before dehydration sets in. Thirst sensors become less sensitive to fluctuations in body fluid levels with advancing age. In fact, after the age of 65, most individuals are already in a mild state of relative dehydration before feeling thirsty.

Conventional wisdom advises eight 8-ounce glasses of water daily, a one-size-fits-all guideline. The problem is that we are not all the same size. Some of us need more than that and some can use less. A better approximation is based upon your body weight. Divide your weight, in pounds, by two. Drink a quantity of water, in ounces, equivalent to that number. For example, half the weight of a 150-pound person is 75. The daily intake should be approximately 75 ounces. More would be required during prolonged exposure to heat or during prolonged physical exertion. Two hours prior to exercising in a hot environment, consume 2-3 cups of water and another 1-2 cups about 15 minutes before exercising. During exercise, about 4 ounces of water should be consumed every 15 minutes to replace water lost through sweat and maintain blood volume. A loss of only 2% of body weight through sweating can bring on the onset of dehydration.

Early signs of dehydration include dizziness, fatigue, headache, and loss of appetite. Advanced dehydration is manifested by a rapid pulse, shortness of breath, deep yellow urine, blurred vision and hearing loss.

With advancing age, it becomes increasingly difficult to ensure you are actually drinking the amount of water you need. Thirst is an unreliable indicator that the body requires

more water. One solution is to place a pitcher in the refrigerator filled with the amount of water you plan to drink each day. Be sure you empty it by the end of the day and start over again. An alternative way to approximate whether you are drinking enough fluid is by looking at your urine. It should be paler than the color of a lemon. When it becomes darker, you need more fluid.

Caffeine has a diuretic effect, causing additional water to be lost as urine. For many people that can amount to about 50% of the volume of the caffeinated beverage. In other words, if you drink 8 ounces of a caffeinated beverage like coffee, you may lose 50%, or 4 ounces, due to the diuretic effect. If you were keeping track of your daily fluid intake, you would be adding only 4 ounces of water to your total. Alcohol causes an even greater diuretic effect for most individuals, resulting in a net loss. You should drink an ounce of water for every ounce of an alcoholic beverage, just to break even. For example, if you drink 12-ounces of beer, drink 12-ounces of water. Neither would add to your total daily intake of water.

Consumption of salt in excess of recommended dietary requirements draws water out of the cells thereby impairing cellular function. Salt depletion may occur during endurance type exercises, and when consuming water only. Salt tablets are generally not recommended because they draw water out of the body and into the stomach.

Micronutrients

Micronutrients are comprised of vitamins and minerals, amino acids, anti-oxidants and various phytonutrients.

Vitamins are organic molecules that are essential for normal metabolism, growth and development, and for the regulation of cell function. Since they generally cannot be synthesized by human cells, vitamins must be supplied in the diet or via a supplement. Vitamins require no digestion and are absorbed directly into the bloodstream. The 13 vitamins identified are divided into two groups, fat-soluble and water soluble. The fat-soluble vitamins, which include A, D, E, and K are stored in the liver and in body fat. Megadoses of fat-soluble vitamins can produce a toxic effect in the liver and can accumulate in the tissues. Symptoms of toxicity are bone and joint pain, blurred vision, dry skin, and hair and weight loss. The body does not store water-soluble vitamins.

Minerals, in contrast to vitamins, are inorganic. The body requires minerals for all aspects of life. Their major functions are to form the structural elements of the body and to speed up enzymatic reactions. Since the body cannot produce its own minerals, they must be provided through food sources or supplements. Like vitamins, minerals require no digestion. Minerals are divided into two groups, major and trace minerals. Some minerals are required in relatively large amounts, while others are only needed in ultra-trace quantities. Major minerals are those that are required by the body in quantities greater than 100 mg per day. Trace minerals are those that are required by the body in quantities less than 100 mg per day.

Nutraceuticals and botanicals form a broad class of nutritionally bioactive substances that can support health in a variety of ways. Many nutraceuticals are derived from plants. Botanicals are plants and herbs.

Fruits, vegetables, grains, legumes, nuts, and teas are rich sources of phytonutrients. The following are some of the mechanisms by which phytonutrients protect human health:

- Antioxidants quench damaging free radicals
- Enhance the immune response
- Enhance cell-to-cell communication
- Alter estrogen metabolism in beneficial ways
- Enhance methylation
- Enhance cell apoptosis, causing cancer cells to die
- Repair DNA damage
- Detoxify carcinogens through activation of the cytochrome P450 and phase II enzyme systems

Deficiencies of micronutrients lead to malnutrition. The goal of optimum nutrition is to eat foods that are nutrient-rich and calorie-poor, rather than the typical American diet, comprised of calorie-laden, but nutrient-deprived meals. The American Cancer Society estimates that at least one-third of all cancers are associated with diet; suboptimal micronutrient intake being one of the primary reasons. The primary source of these micronutrients should come from the food you eat, instead of nutritional supplements. Calorie for calorie, vegetables are generally the richest in these essential and health-promoting nutrients. Brightly colored foods are generally the most abundant in micronutrients. The highest concentration of phytonutrients can be found where the color of the food is deepest. Think of the rainbow of colors found amongst foods in the produce section of your grocery store - the fruits and vegetables that are deep blue, purple, red, green, white, or orange. Therein lay the health-enhancing nutrients found to protect against heart disease and cancer, and improve your memory, and other cognitive skills. Your food color chart should include the entire palate:

1. Deep Green - Are associated with a 70 percent reduction in cancer risk. Cruciferous vegetables like broccoli may help prevent colon cancer, while spinach and kale are good sources of calcium. Spinach, collard greens and kale may reduce the chance of developing age-related macular degeneration by 46 percent, the leading cause of blindness in older Americans.
2. Red - Red tomatoes, especially when cooked, are beneficial sources of lycopene, which helps protect against cervical cancer. High consumption has been associated with a 35 percent reduction in prostate cancer risk.
3. Orange/Yellow - Squash, carrots, sweet potatoes, and yams promote healthy lungs and help fight off skin cancers such as squamous cell carcinoma.
4. Deep Blue/Purple - Eggplants, plums, blueberries, blackberries (strawberries, raspberries, and cherries come under this category as well) lower your risk of heart disease by helping the liver “sop up” extra cholesterol, as well as improve your mental functioning.
5. White – Onions contain antioxidants and anti-inflammatory agents such as

quercitin.

The enormous variety of micronutrients found in fruits and vegetables may lower your risk for osteoporosis, stroke, prostate cancer, breast cancer and other causes of mortality. Some studies find that women who eat more fruits and vegetables have a lower risk of developing breast cancer. High-risk women for breast cancer who consume five or more servings can lower their risk by 70%. Five to six servings lower the risk of stroke by 31%. A 26-year study showed men who ate lots of fruits and vegetables were more likely to be alive at 80. A Nurses' Health Study (2000) found that American women who ate the most fruits and vegetables had a 21-32% lower risk of lung cancer. The greatest protection was found with the intake of cruciferous vegetables (broccoli, cauliflower, Brussels sprouts and cabbage) and citrus fruits. Another study showed a 41% reduction in prostate risk with intake of cruciferous vegetables.

Heart disease accounts for approximately 40% of all deaths in the United States. A study found that those in the highest quintile of fruit and vegetable intake (9 and 10 servings a day) had a 20% lower risk of coronary heart disease than those with the lowest intake. The list of benefits go on further in various studies for high blood pressure, stroke, bone health, neurodegenerative diseases like dementia and Alzheimer's disease, arthritis, diabetes, diverticulosis, and cholesterol.

Research suggests that combining different fruits and vegetables in the same meal may boost their disease-fighting potential. It may not be practical to get the full spectrum of colors daily, particularly when certain foods are not available or in season year round. When fresh produce cannot be found, frozen will suffice. Canned fruits and vegetables offer little nutritional benefit (except tomatoes), as the canning process destroys many of the micronutrients. Variety is the spice of life. When it comes to micronutrients, variety is the key to life.

Tea is another rich source of micronutrients, especially antioxidants. Green tea and white tea are the preferred choices, but black tea offers some benefit. Four to six cups of green tea daily (decaffeinated, if more than two cups are consumed) can be a significant part of a healthy-aging lifestyle. Most herbal teas, while tasty, are not as rich in phytonutrients. Tea offer many health benefits, such as lowering cholesterol and aiding in weight loss, for example. Some methods of decaffeination remove most of the antioxidant from tea. If the caffeine extraction process used does not reduce antioxidants the package label will generally tell you.

Go Organic

Buy "Certified Organic" food products to reduce your exposure to toxins and increase your nutrient intake. Conventionally grown foods may contain high levels of pesticides, antibiotics, hormones, and other additives. Sixty percent of all herbicides, 90 percent of all fungicides, and 30 percent of all insecticides are considered carcinogenic by the Environmental Protection Agency. "Estrogen mimics" produced by agrichemicals can create hormone imbalances, cellular mutations and micronutrient malnutrition, resulting in cancer or chronic diseases. Furthermore, organic crops are frequently more

nutritious, containing 27% more vitamin C, 21% more iron and 15% less nitrates than conventionally grown produce, according to a meta-analysis of 41 studies published in the Journal of Alternative and Complementary Medicine. Another study in the March 2005 issue of Food Technology Magazine compared nutrient levels from 43 different inorganic crops from 1950 to 1999. The study reported substantial decreases in nutrient concentration including a six% loss of protein, 16% reduction of calcium, 15% loss of iron, a 38% loss in riboflavin and a 20% drop in vitamin C content. Much of this loss is believed to be the result of nutrient-depleted soil.

Some food products are more likely to pose health risks from chemical exposures than others are. Even after washing, some fruits and vegetables consistently carry much higher levels of pesticide residue than others do. For information about pesticide levels of produce, go to www.foodnews.org. The non-profit organization Environmental Working Group (EWG) also publishes a list of produce containing pesticides.

Here is a summary of the current evidence:

- Buy these items organic as often as possible, because conventionally grown counterparts tend to be laden with pesticides:
    - Apples, sweet bell peppers, celery, cherries, imported grapes, nectarines, peaches, pears, potatoes, red raspberries, spinach, lettuce, and strawberries
- Buy these items organic as often as possible because conventionally grown counterparts tend to have some pesticides, but fewer than those listed above
    - Carrots, green beans, hot peppers, cucumbers, raspberries, plums, grapes, oranges, grapefruit, tangerines, mushrooms, cantaloupe, honeydew melon, tomatoes, sweet potatoes, watermelon, winter squash, cauliflower, blueberries
- Buy these items organic as often as possible to avoid the use of hormones and antibiotics, which have been linked to increased antibacterial resistance in humans and possible increased cancer risks. Furthermore, you greatly reduce the risk of exposure to the agent believed to cause mad cow disease and minimize exposure to other potential toxins in non-organic feed
    - Meat, poultry, eggs, and dairy
- Buy these items organic if you are not concerned about price.
    - Asparagus, avocados, bananas, broccoli, cauliflower, sweet corn, kiwi, mangos, onions, papaya, pineapples, and frozen sweet peas. Multiple pesticide residues are, in general, rarely found on conventionally grown versions of these fruits and vegetables
    - Breads, oils, potato chips, pasta, cereals, and other packaged foods, such as canned or dried fruit and vegetables. These products have lower levels of contaminants in them, but they offer limited health value because processing tends to eliminate important nutrients. The process of milling organic whole grains into flour, for example, eliminates fiber and vitamins, though they are sometimes added back in. The more a food is processed, the less health value its organic version offers, especially in products such as cereals and pastas. The processed foods with the most added value

are labeled “100% Organic” and “USDA organic.”

- Don’t bother buying organic seafood. Whether caught in the wild or farmed, fish can be labeled organic, despite the presence of contaminants such as mercury and PCBs.
- Nitrates are another additive to avoid, as nitrates have been associated with a number of cancers.

Where to Begin

Prepare your Kitchen for Nutritionally-Balanced Cooking

- Remove potentially dangerous foods that might tempt you and prevent you from eating optimally. This includes:
  - Unfavorable carbohydrates like rice, pasta, breads, bagels, most cereals, and mixes for pancakes, cookies and cakes.
  - Dried fruits and fruit juices.
  - Bananas, cranberries, dates, figs and raisins
  - Bread maker, juicer, and pasta machine
  - Vegetable oil, vegetable shortening, butter, whole milk dairy products and any other foods high in omega-6 fatty acids.
  - Canned vegetables (except tomatoes) and fruits
- Replace
  - Processed meats like bologna and bacon with low fat sources of protein, such as turkey, chicken and fish. Use soybean products like soy hamburgers and soy sausages.
  - Vegetable oils with olive oil and nut butters (e.g., almond butter) which are rich in monounsaturated fats
- Minimize starchy vegetables such as acorn squash, beets, butternut squash, carrots, corn, peas and potatoes
- Purchase a kitchen scale
- Stock up on
  - Fresh fruits such as apples, oranges, pears, all kinds of berries, grapes and grapefruit. Create a rainbow of color.
  - Dark green leafy vegetables, tomatoes, celery, mushroom, peppers
  - Frozen fruits and vegetables are acceptable
  - Staples such as slow-cooking oatmeal, isolated protein powder, nuts (e.g., almonds, walnuts, cashews, pistachio, macadamia), and spices
  - Olive oil
- Shopping
  - Spend most of your time along the periphery of the supermarket and avoid the aisles. The perimeter of most grocery stores is generally where you will find fresh produce, fish, poultry, dairy products and so forth. When you get into the aisles in the center of the grocery store, you will find the starches, snack foods, candy and ice cream, canned goods, high-glycemic foods and so on.
  - Select organic whenever possible (see list above)

Nutrition Tips

- Make whole or minimally processed foods the bulk of your nutritional lifestyle.
- Go organic whenever possible (see recommendations above)
- Eat the widest possible variety of foods
- Consume food raw, steamed, or lightly stir-fried
- Graze: Eat regularly throughout the day (5-6 meals per day)
- Don't wait until you are hungry to eat
- Eat slowly, so your brain can catch up with your stomach to let you know you have eaten enough
- Push yourself away from the table when you are 80% full
- Choose seasonal, local produce
- Frozen fruit and vegetables are acceptable
- Make substitutions when you eat out
- Be aware of hidden fats and calories in foods
- Think "healthy" at the grocery store; shop along the store perimeter
- Don't let situations you can't control stop you from making smart food choices
- Make healthy eating fun!
- Avoid
    - All grains and starches for the first 1-2 weeks. Thereafter, you may find you feel better eliminating them most of the time
    - Processed foods, sweets, white bread, biscuits, breadsticks, and other refined carbohydrates
    - Vegetables prepared in butter or cream sauces when possible
    - Juices, except vegetable
    - Canned foods, except fish and tomatoes
    - Bacon, sausage, other processed or high-fat meat, milk or cheese that is not low-fat, ice cream
    - Fried fish (except when pan-fried in olive oil)
    - Omega-6 oils found in processed vegetable oils (corn, sunflower, safflower, soybean, peanut)
    - Heavily salted or honey-roasted nuts; stale or rancid nuts
    - Fast food, fried food, margarine (unless trans-fat-free), chips, crackers, baked goods, doughnuts, any processed food made with partially hydrogenated oil
    - Avoid "farm-raised" salmon and make sure it comes from cold water
    - Foods containing pesticides, nitrates, antibiotics, and hormones
    - Cereals containing more than 9 grams of sugar and less than 4 grams of fiber per serving
    - Overcooking your food
    - Cooking at very high temperatures
- When selecting olive oils use only "Extra Virgin", which have the highest levels of polyphenols (like tyrosol, hydroxytyrosol and oleuropein), and the lowest levels of saturated fats and omega-6 fatty acids. To ensure you have purchased true "Extra Virgin" olive oil, check the label for "COOC" (California Olive Oil Council, U.S.), DOP (Denominazone Di Origine, Italy), DO (Denominacion Di Origen, Spain), HEPO (Greek foreign trade board), or the Chianti Black Rooster logo.

Also, check harvest date. Flavor and quality degrade with age, and when the oil is bottled in reactive metals or plastic. Store the oil away from light and heat. Dispose of any remaining oil 6 months after a bottle has been opened, as it will slowly oxidize.

- Use olive oil in your dressing and canola oil for cooking
- Caution when buying "fat-free" products - they are usually loaded with sugars
- Limit caffeine to 2 cups per day
- Eat low on the food chain - avoid products with a long list of ingredients
- Fiber
  - An overly rapid boost in dietary fiber can cause you to feel bloated, gassy, and uncomfortable. Allow your body to get used to your high-fiber diet. Increase your daily fiber intake by just 5 grams per week.
  - If you consume a lot of fiber but don't increase your water intake, you may end up constipated.
- Vinegar-based dressings help reduce the number of colonies of E. coli bacteria on vegetables
- Keep hot foods hot and cold foods cold.
- Wash fresh fruits and vegetables thoroughly before eating
- Cook poultry, meat, and fish thoroughly
- Wash kitchen counters and utensils frequently with soap and hot water, especially after preparing poultry and other meat. Wash and sanitize cutting boards after use. Either put them in the dishwasher or wash and rinse in a solution of 1 teaspoon of chlorine bleach to 1 quart of water. Consider two cutting boards: one for raw foods and one for cooked foods
- Use a clean, dry paper towel to dry your hands (never a sponge or kitchen towel that has already been used)

Preparing a Balanced Meal

The human body was designed to graze as opposed to the way we usually eat - having a few large meals in 24 hours. To maintain food-sensitive hormones in balance and at optimal levels plan to eat 5-6 meals throughout the day. You can do this by having three main meals and 2-3 light, nutritious snacks daily. Properly prepared, the major meals should give you 4-6 hours of energy and hormonal balance. A proper snack will give you balance for 2-3 hours.

Remember the old saying, "Eat breakfast like a king, lunch like prince and dinner like a pauper." This is reasonable advice in a world where we have turned this wisdom on its head. Even though you have probably heard that breakfast is the most important meal of the day, the typical American eats the largest meal of the day in the evening and the smallest meal of the day at breakfast. Studies show that people who eat breakfast every day are less likely to become obese or diabetic than those who seldom eat breakfast. Here are some simple rules to insure the energy and hormone effects from eating are optimized in your favor:

- Always eat a meal or snack within one hour after waking. When you wake up you are coming out of a fast. Your metabolism slows down while sleeping, so you don't burn as many calories until you begin eating. Breakfast got its name

because it is breaking your (nighttime) fast. Eating a meal stimulates your metabolism (as does exercise). There is something called the thermic effect of food, which is that you burn approximately 10% of the calories you eat just by eating. Some people notice that they are hungrier in the day if they eat breakfast. This simply means that the breakfast increased their metabolism. If you skip breakfast and are not hungry until noon, it means your metabolism is not going at the rate it is capable of and you are burning fewer calories. To help with that hunger you might experience after breakfast, always get some good lean protein (or good fat), which helps satiate your appetite

- Eat every 4-6 hours (breakfast, lunch, dinner) or 2-3 hours after a snack, whether you are hungry or not, to maintain energy and hormones at optimal levels. In fact, the best time to eat is when you aren't hungry at all. That means the insulin levels are still stabilized. If you wait until you are hungry, your blood sugar is already unbalanced and you are more likely to overeat. It is difficult to make good mindful decisions when you are hungry.
- Adequate energy, lack of hunger, and clear mental focus are good indicators that you are hormonally balanced. Before every meal and snack, take a moment to assess your energy level, hunger, and degree of mental focus.
- Every meal and snack should start with low-fat protein. Your body requires regular infusions of protein throughout the day. Next add low-density carbohydrates (eat more leafy green vegetables and fruits and less pasta, breads, grains and starches) and "good" fats (e.g., olive oil, canola oil, nuts, avocado)
- A typical serving size of low-fat protein is approximately the size and thickness of the palm of your hand. For most females, this is 3 ounces of low-fat protein, and for males, this equals 4 ounces. A balanced snack should provide about 1 ounce of protein for both men and women. At first, a kitchen scale will be helpful to measure the protein portion. You will soon learn to estimate these amounts at home, in restaurants and fast food take-outs.
- Protein that is low in saturated fat includes fish, lean cuts of meat (fat trimmed) or poultry (white meat; no skin); fat-free dairy foods (skim milk, fat-free yogurt, fat-free cottage cheese, egg whites), plant-based protein such as soy, and protein powders (whey, soy, egg white)
- When it comes to low-density carbohydrates, there really is no need to measure, since it's next to impossible to over-consume vegetables and fruits. One approach is to divide your plate in three equal sections. Add the protein portion to one third and fill the remaining two-thirds of the plate with low-density fruits and vegetables. In most cases, this will be the equivalent of consuming 7-10 servings of fruits and vegetables daily.
- Fruits and vegetables should be consumed in a <u>wide</u> variety, with special attention to those darker in color. Berries are particularly nutritious
- Try to think of high-density carbohydrates (grains and starches) as condiments, consumed in limited quantity. Best choices are whole-grain bread and cereal, bran, and brown rice
- Soybeans; lentils, or any kind of peas, beans, or legumes (in limited quantities); tree nuts (e.g., almonds, pecans, walnuts, Brazil nuts) may be eaten

- Add a small amount of fat, like olives, avocado, extra-virgin olive oil, canola oil, flaxseed oil ("high-oleic" sunflower or safflower oil may also be an option), or a few nuts
- Fish or other sources of omega-3 fatty acids include salmon, trout, herring, water-packed tuna, mackerel (or fish oil supplement); flaxseed, spinach, walnuts
- Human beings are composed of about 70% water and need to stay well hydrated. Drink at least half your weight in ounces of water daily is the minimum fluid requirement for adults. Drink to maintain your urine paler than the color of a lemon. Eat your calories, don't drink them. Try to have water and tea as the main sources of fluid in your diet.
- Wine (especially red),
  - When consumed in low to moderate levels, can contribute to a reduced risk for coronary heart disease
  - Women should consume no more than 1 serving daily and men should not exceed 2 servings daily.
  - When consumed, should be drunk during a meal. If you drink alcohol before a meal, rather than during a meal, your appetite may be stimulated, resulting in the consumption of up to 30% more calories
  - Should be avoided with a history of substance abuse, alcoholism, liver disease and other conditions directed by your physician
- Variety is the spice of life, and this is no less true with the food you eat. Seek out variety, to optimize the range of micronutrients in your diet. While many have called broccoli the perfect vegetable, if that is the only vegetable you eat, you will miss numerous nutrients and health benefits obtainable only from consuming a variety of vegetables.
- If you make a mistake, don't beat yourself up. Your next meal or snack can take you back into balance.

Tired of Salads with the Same Dressings?

Here are some healthful alternatives you should find fun and interesting:

- Blend some light vinaigrette with pureed fruit (e.g., pear or raspberry) to give it some punch
- Dilute a regular calorie salad dressing with apple juice (if it's a vinaigrette), half and half
- Dilute regular creamy dressing with fat free sour cream, half and half
- Mix mustard with artificial sweetener to taste
- Rice wine vinegar and olive oil
- A substitute for vinegar is lemon juice: just squeeze a bit of lemon, add salt and some oil
- Slice juicy fruits (like mango or berries) into small pieces and mix well with the salad
- Fruit juice alone (e.g., orange juice)
- Try a tastier lettuce than iceberg, e.g., red leaf, green leaf, and Boston lettuce

Your Guide to Eating Out

Restaurant food is notoriously high in fat and salt. Serving sizes have become supersized over the years. However, most table-service restaurants will alter food preparation if you request. Here are some ideas to eat well and enjoy eating out:

- Help suppress your appetite by having a salad with low-fat dressing (on the side), or with raw vegetables. Sometimes having a little fat at the beginning of the meal will help satiate your appetite
- Pass on bread
- Pass on fried and sautéed foods
- Request olive oil instead of butter
- Choose entrees that are steamed, poached, broiled, roasted, baked, or cooked in their own juices
- Fish is usually a good choice
- Avoid red meats.
- Remove the skin from chicken and turkey
- Avoid thick, creamy sauces such as hollandaise or béarnaise, or anything resembling gravy. Instead, choose stock-based or tomato-based sauces
- Ask for vegetables freshly steamed, with no added oil or butter
- Order salad dressing on the side, or try plain balsamic vinegar or lemon juice
- Eat small or half-portion meals
- If you're invited to a party where everything's going to be heavy or calorie-laden, eat before you arrive and eat less when you get there
- Push yourself away from the table when you feel 80% full

Choices for Healthful Seafood

It's okay to ask questions when shopping or eating out. Ask restaurant or grocery store staff where their seafood is from. Is it farmed or wild-caught? How is it caught? If they're not sure, choose something else. Why should you care if it is farm-raised? Farmed salmon, raised in pens, tend to accumulate more PCBs and dioxins than do wild. These chemicals can cause cancer and reproductive problems. Because they are also fat-soluble, they can stay in your body's fat tissue for years. Some studies suggest that farmed salmon may have higher PCB and dioxin concentrations than many common foods.

Although farmed salmon isn't inherently less healthful, it is what it eats: typically concentrated fish meal and fish oil. Unfortunately, much of the fish that go into this feed lived in polluted waters. Here is the smart way to buy: Choose wild salmon during the summer months. In the U.S., about 90% of wild fresh salmon comes from Alaska, where commercial harvest starts in May and ends in September. Alaska salmon is wild by definition. Your best bet for wild salmon in the winter may be canned Alaska salmon. King salmon is caught nearly all year but is in limited supply from late fall to early spring. When you buy farmed salmon, choose Atlantic salmon from Chile, the U.S., or Canada, because it is likely to have lower levels of PCBs and dioxins than salmon from Europe.

Here are additional ways to minimize consuming high levels of contaminants:

- Choose fish from clean waters, such as Alaska or the Pacific Ocean
- Some seafood species have such consistently low mercury levels that everyone

can safely eat them every day
    - Salmon
    - Shrimp
    - Clams
    - Tilapia
- Other low-mercury species can be safely consumed nearly daily
    - Oysters
    - Hake
    - Sardines
    - Crawfish
    - Pollock
    - Herring
    - Flatfish (flounder, sole)
    - Mullet
    - Atlantic mackerel
    - Scallops
    - Crab
    - Atlantic croaker

- In general, eat mainly smaller, non-predatory species such as
    - Catfish
    - Clams
    - Flounder
    - Halibut
- Avoid
    - Large, long-lived predatory species, such as
        - Shark
        - Swordfish
        - Tuna (instead choose smaller size tuna, such as albacore)
        - King Mackerel
        - Halibut
        - Tilefish
    - Avoid freshwater fish from lakes and rivers, especially polluted areas, and from the Great Lakes

The Monterey Bay Aquarium Seafood Watch (www.montereybayaquarium.org) is an excellent resource for consumer choices. Choose seafood from the Best Choices list below to support those fisheries and fish farms that are healthier for the ocean wildlife and the environment.

<u>Best Choices</u>

These fish are abundant, well-managed and caught or farmed in environmentally friendly ways.

- Abalone (farmed)
- Catfish (U.S. farmed)
- Clams (farmed)
- Crab, Dungeness

- Halibut (Pacific)
- Lobster, Rock/Spiny (CA, Australia)
- Mussels (farmed)
- Oysters (farmed)
- Sablefish/Black Cod (AK, BC)
- Salmon (CA, AK; wild-caught)
- Salmon, canned
- Sardines
- Sea Bass, White
- Shrimp/Prawns (trap-caught)
- Striped Bass (farmed)
- Tilapia (farmed)
- Trout, Rainbow (farmed)
- Tuna, Albacore/ Bigeye /Yellowfin (troll/pole-caught)

Caution or Avoid

There are some problems with the way seafood is caught or farmed, or these fish come from sources that are over-fished or caught or farmed in ways that harm the environment. Salmon farming pollutes ocean shorelines and is slowly depleting the oceans of fish.

- Chilean Sea Bass
- Clams (wild-caught)
- Cod, Atlantic/Pacific/Icelandic
- Crab, King (AK, imported)
- Crab, Snow
- Lobster, American
- Mahi-Mahi
- Monkfish
- Mussels (wild-caught)
- Orange Roughy
- Pollock
- Rockfish/Rock Cod/Pacific Snapper
- Sablefish/Black Cod (CA, WA, OR)
- Salmon (farmed; Atlantic, esp. from Scotland and the Faroe Islands; OR,WA-wild-caught)
- Scallops, Bay/Sea
- Sharks (except U.S. West Coast Thresher)
- Shrimp (U.S. farmed or wild-caught; imported)
- Sole, English/Dover/Petrale/Rex
- Sturgeon (wild-caught)
- Swordfish (Atlantic; U.S. West Coast)
- Tuna, Albacore/Bigeye/Yellowfin (longline or purse seine-caught)
- Tuna, Bluefin

Calorie Equivalents for Popular Foods and Beverages		
Food	Size/Serving	Approximate Calories
Alcohol		
gin, rum, vodka, whiskey		
80 proof	1 1/2 ounces	104
100 proof	1 1/2 ounces	133
Almonds	12 to 15 nuts	90
Apple	1 medium (2 1/2" diameter)	87
Apple juice	3/4 cup	87
Apricots	2 to 3 medium	51
Asparagus	5 or 6 spears	26
Avocado	1/2	185
Bagel, water or egg	1	165
Banana	1 small (6" long)	85
Beans (green, yellow or wax)	1 cup	32
Beans, lima	5/8 cup	111
Beans, red kidney	2/5 cup p	118
Beef		
flank steak (lean only)	3 ounces	180
ground, lean	3 ounces	180
roast, lean	3 ounces	180
Beer	12 ounces	151
Blueberries	1 cup	87
Bologna	1-ounce slice	88
Bread		
rye	1 slice	56
white	1 slice	62
Whole wheat	1 slice	56
Broccoli	1 stalk (5 1/2" long)	32
Brussels sprouts	9 medium	45
Butter		
sweet	1 tablespoon	108
whipped	1 tablespoon	81
Cabbage	3/5 cup, cooked	14
Cantaloupe	1/4 melon (5" diameter)	30
Carrots	1 large or 2 small	42
Cashews	6 to 8 nuts, roasted	84

Calorie Equivalents for Popular Foods and Beverages		
Food	Size/Serving	Approximate Calories
Cauliflower	1 cup	27
Celery	1 small stalk (5" long)	3
Cereals		
bran flakes	1 cup	106
corn flakes	1 cup	110
shredded wheat	1 biscuit	89
Cheese		
American	1 ounce	107
cheddar	1 ounce	112
cottage, uncreamed (1 % fat)	1 cup	163
farmer	1 ounce	80
Mozzarella	1 ounce	79
Cherries		
red, sour	1/2 cup	58
sweet	15 large or 20 small	70
Chicken	3 ounces, broiled	180
Cod	4 ounces, broiled	162
Cola	12 ounces	129
Cola, sugar-free	12 ounces	2
Corn	1 medium ear	100
	1/2 cup	70
Crab	3 1/2 ounces, steamed	93
Crackers		
Graham	2 crackers	54
rye wafers	1	24
saltines with unsalted tops	2	26
whole wheat	2	32
Cucumber	1/2 medium	8
Doughnuts, plain	1 average	125
Egg	1 large	80
Flounder	3 1/2 ounces, raw	68
	3 1/2 ounces, baked with oil	202
Frankfurter	1 average	124
Grapefruit	1/2 medium (4" diameter)	41
Grapefruit juice	2/5 cup	30
Haddock	3 1/2 ounces, broiled	141
Ham, boiled	I-ounce slice	66
Honeydew	1/4 small (5" diameter)	33
Ice cream	1/2 cup	145

Calorie Equivalents for Popular Foods and Beverages		
Food	Size/Serving	Approximate Calories
Ice milk	1/2 cup	111
Jams, jellies		
all varieties	1 tablespoon	55
low-calorie	1 tablespoon	29
Lamb	3 ounces, lean	190
Leeks	3 to 4 (5" long)	52
Lemonade, frozen, from concentrate	1 cup	110
Lentils	2/3 cup, cooked	106
Lettuce	3 1/2 ounces	14
Macaroni and cheese, homemade	1 cup	430
Margarine		
unsalted	1 tablespoon	108
whipped	1 tablespoon	86
Mayonnaise	1 tablespoon	101
Milk		
skim	1 cup	89
whole	1 cup	150
Muffins		
blueberry	1 average	112
bran	1 average	104
corn	1 average	141
English	1 whole	138
whole wheat	1 average	103
Mushrooms	10 small or 4 large	28
Nectarines	2 medium	64
Noodles	1/2 cup, cooked	100
Oatmeal/rolled oats	1/2 cup, cooked	148
Oil		
corn	1 tablespoon	126
safflower	1 tablespoon	124
sunflower	1 tablespoon	124
Onions	1 (2 1/4" diameter)	38
Orange	1 medium (3" diameter)	73
Orange juice	2/5 cup	48
Peach	1 medium	38
Peanut butter	1 tablespoon	86
Pear	1/2 pear (3" x 2")	61
Peas	3/4 cup	84
Pepper, green	1 large shell	22
Pineapple	1/2 cup, diced	52
Plums, Damson	2 medium	66

Calorie Equivalents for Popular Foods and Beverages		
Food	Size/Serving	Approximate Calories
Popcorn	1 cup, air popped (no oil)	30
Pork loin chop (lean only)	3 1/2 ounces, cooked	250
Potato		
baked	1 (2 1/2" diameter)	95
	1 (3 1/4" diameter)	139
fried from raw	1/2 cup	228
mashed with milk and margarine	1/2 cup	94
Raisins	1 tablespoon	29
Rice		
brown, raw	1/4 cup	176
brown, cooked	1 cup	178
white, raw	1/4 cup	178
white, cooked	1 cup	164
wild, raw	1/4 cup	99
wild, cooked	1 cup	220
Roll		
dinner, whole wheat	1 (2" diameter)	90
hamburger	1 Average	89
Salad dressing		
French	1 tablespoon	57
French, low-calorie	1 tablespoon	22
Italian	1 tablespoon	77
Italian, low-calorie	1 tablespoon	7
Sauerkraut	2/3 cup, drained	18
Shrimp	3 1/2 ounces	91
Soup		
minestrone	1 cup	115
tomato	1 cup	75
vegetable	1 cup	70
vegetable bean	1 cup	130
Spaghetti	1 cup, cooked	216
Spinach	1/2 cup/ cooked	21
Squash, yellow	1 cup	15
Strawberries	1 cup	56
Sugar	1 teaspoon, level	16
Tangerine	1 large or 2 small	46
Tomato	1 large	44
Tomato juice	3/4 cup	34
Tuna		
in oil, drained solids	5/8 cup	197
in water, solids and liquids	1/2 cup	127

Calorie Equivalents for Popular Foods and Beverages		
Food	Size/Serving	Approximate Calories
Turkey	3 1/2 ounces, roasted	190
Veal chop	3 ounces, broiled	210
Walnuts, English	8 to 15 halves	98
Watermelon	1 slice (6" diameter x 1 1/2")	156
Wine, table	3 ½ ounces	85
Yogurt		
low fat with nonfat milk solids	1 cup	143
low fat, vanilla- and coffee-flavored with nonfat milk solids	1 cup	194
Zucchini	1 cup	15

Vegetarian Protein Sources[1]		
Protein Source	Serving Size	Grams Protein
Soy Products		
Crumbles (Morning Star Farms)	1	8
Boca Burger	1	12
Garden Vegan (Garden Burger)	1	11
Smart Dog (Lite Life)	1	19
Soy Beans (Edamame)	½ cup	10
Soy Milk	1 cup	6.2
Soy Powder	1 Tbsp	9
Tempeh	2 oz	15.7
Tofu	4 oz	10
Veggie Burger (Morning Star Farms)	1	8
Yves Veggie Deli Slices	3 slices	6
Dairy		
Fat Free Cheese or Cream Cheese	1 oz	4
Nonfat Cottage Cheese	½ cup	14
Nonfat Milk or Buttermilk	1 cup	8.4
Nonfat Plain or Light Yogurt	1 cup	7
Dried Beans (cooked)		
Black Beans	½ cup	7.6
Garbanzo Beans (chickpeas)	½ cup	7.3
Great Northern	½ cup	7.4
Kidney Beans	½ cup	7.7
Lima Beans	½ cup	7.4
Pinto Beans	½ cup	7
Lentils and Peas (cooked)		
Black-eyed Peas	½ cup	5.7
Green Peas	½ cup	2
Lentils	½ cup	8.9
Split Peas	½ cup	4.1
Egg Whites	2	7
Egg Substitute (Fat-Free)	¼ cup	7.3
Whole Grain Products		
Seitan	2 oz	12
Durum Wheat Spiral Pasta (Eden Foods)	1 cup cooked	8
Garden Vegan Burger	1	9
Old Fashioned Oatmeal	½ cup	2.4
Raisin Bran	¾ cup	3.2
Shredded Wheat	1 biscuit	2.5
Wheat Germ	2 Tbsp	6.7

[1] Scripps Clinic Wellness Programs 7/99

Vegetarian Protein Sources[1]		
Protein Source	Serving Size	Grams Protein
Whole Wheat Bread	1 slice	2.6
Vegetables		
Asparagus	½ cup cooked	2.9
Broccoli	½ cup cooked	2.7
Brussels sprouts	½ cup (4 sprouts) cooked	3.3
Collards	½ cup cooked	3.4
Corn	½ cup cooked	2.5
Spinach	½ cup cooked	2.7
Sweet Potato	½ cup cooked	2.6

Protein Content of Selected Vegan Foods[1]			
Food	Amount	Protein (gm)	Protein (gm/100 cal)
Tempeh	1 cup	41	9.3
Seitan	3 ounces	31	22.1
Soybeans, cooked	1 cup	29	9.6
Lentils, cooked	1 cup	18	7.8
Black beans, cooked	1 cup	15	6.7
Kidney beans, cooked	1 cup	13	6.4
Veggie burger	1 patty	13	13.0
Chickpeas, cooked	1 cup	12	4.2
Veggie baked beans	1 cup	12	5.0
Pinto beans, cooked	1 cup	12	5.7
Black-eyed peas, cooked	1 cup	11	6.2
Tofu, firm	4 ounces	11	11.7
Lima beans, cooked	1 cup	10	5.7
Quinoa, cooked	1 cup	9	3.5
Tofu, regular	4 ounces	9	10.6
Bagel	1 med. (3 oz)	9	3.9
Peas, cooked	1 cup	9	6.4
Textured Vegetable Protein (TVP), cooked	1/2 cup	8	8.4
Peanut butter	2 Tbsp	8	4.3
Veggie dog	1 link	8	13.3
Spaghetti, cooked	1 cup	8	3.7
Almonds	1/4 cup	8	3.7
Soy milk, commercial, plain	1 cup	7	7.0
Soy yogurt, plain	6 ounces	6	4.0
Bulgur, cooked	1 cup	6	3.7
Sunflower seeds	1/4 cup	6	3.3
Whole wheat bread	2 slices	5	3.9
Cashews	1/4 cup	5	2.7
Almond butter	2 Tbsp	5	2.4
Brown rice, cooked	1 cup	5	2.1
Spinach, cooked	1 cup	5	13.0
Broccoli, cooked	1 cup	4	6.8

[1] USDA Nutrient Database for Standard Reference, Release 18, 2005 & manufacturers' information

NOTES

Optimal Fitness for Living Younger

"If people knew how hard I worked to get my mastery,
it wouldn't seem so wonderful after all" - Michelangelo

Boosting your physical activity can actually decrease your biological age by at least 8-10 years! In fact, fitness cuts your risk of dying. It doesn't get much better than that. Exercise can negate many of the adverse effects from other risk factors, such as smoking, high blood pressure, and high blood sugar. The more frequent the exercise, the greater the benefit. This overriding effect of fitness, and its apparent effect as a remedy for various chronic diseases, makes physical fitness among the most important things an aging person can do to remain healthy. If you are at risk because of certain genetics or habits you cannot change, getting in good physical shape is a valuable step you can take to keep yourself alive longer. A physically active life may allow you to approach your true biogenetic potential for longevity.

Physical activity can make a major difference in the risk of many aging-related diseases, including:

1. Coronary heart disease
2. High blood pressure
3. Colon and rectal cancer
4. Breast cancer survival
5. Diabetes and related problems
6. Arthritis
7. Osteoporosis
8. Falls and balance

Want to cut back on trips to the doctor and stay out of the hospital? You may want to start spending more time at the gym. A study reported in the December, 2004, issue of the journal Medicine & Science in Sports & Exercise shows that physically fit men visit their doctors less often and are less likely to require an overnight hospital stay. "Fit men, as well as those who become fit, may reduce health care costs by more than 50%," says researcher Tedd L. Mitchell, MD, of the Cooper Clinic in Dallas.

Another study published in the journal Circulation, March 2004, suggests that regular exercise might slow the progression of mild to moderate coronary heart disease and reduce coronary risk even better than angioplasty. Moreover, the exercisers in the study experienced fewer cardiovascular events, including heart attack, stroke, and hospitalization for worsening angina.

For men, better physical fitness may mean better sex. Harvard researchers concluded that frequent exercise can reduce the risk of erectile dysfunction in older men. They found a 30 percent reduction in the risk of erectile dysfunction in those who exercised vigorously - the equivalent of running at least three hours a week - compared with those who exercise very little or not at all.

In addition to reducing the risk of death and improving strength, exercise improves mood and reduces the impact of other health risks. Exercise can make your heart stronger, improve circulation, lower LDL and raise HDL cholesterol levels, reduce body fat, lower blood pressure, decrease the risk for cancer of the breast, colon, prostate and endometrium, help prevent adult onset diabetes and osteoporosis, plus exercise increases back strength and mobility. Breast cancer survivors have a 20-54% lower risk of dying, depending on the amount of exercise they do. However, keep this in mind: you have to use it, or risk losing it. In order to reap the benefits of physical fitness, you not only need to get into shape - you must stay in shape. Physical activity must be maintained for a lifetime. The substantial protective effect of continued physical activity persists even to advanced old age. Exercise keeps you young only as long as you keep doing it.

Exercising regularly ensures that the body is in a constant state of cellular regeneration. This continual regeneration promotes the production and release of important hormones such as growth hormone and testosterone. Exercise promotes balance in all hormones, improves cellular hormone communication and cellular sensitivity to hormones. For example, diabetics see improvements in sensitivity to insulin with exercise. Similarly, the effectiveness of all hormones improves with exercise.

The benefits of exercise appear to be cumulative. It is possible, nevertheless, to overdo it. Exercise increases respiration and energy production (of ATP) in the cells, resulting in free radical production. The body can safely handle limited free radical production. Excessive levels overwhelm the bodies' ability to scavenge them, resulting in oxidative stress. Oxidative stress, recall, is one of the primary causes of pathological aging. Prolonged, intensive exercise can easily place the body in a state of oxidative stress. Marathon runners, for instance, expose their body to an extended state of oxidative stress. Additionally, extreme and prolonged exercise has been shown to suppress the immune system. This is commonly called overtraining syndrome (OTS). The body needs regular exercise for optimum efficiency, but not too much.

The trouble is that it isn't easy to know whether you have reached a state of free radical overload. On the other hand, monitoring the source of free radicals produced during exercise - energy expenditure - can provide an indirect measure of free radical levels. Measuring caloric expenditure during exercise provides a gauge of respiration and energy utilization. Any amount of exercise is better than no exercise. However, studies suggest that the greatest preventive-aging benefits of exercise mentioned are realized after a minimum daily energy expenditure of at least 300 extra calories from exercise - or more than 2,000 calories a week. A brisk walk burns about 300 calories an hour, and jogging burns about 400-500 calories an hour. The following table provides estimates of caloric expenditure associated with many common forms of exercise. If you have not been exercising regularly, it is best to begin slowly. The long-term goal is to increase your exercise-induced calorie expenditure, slowly, to a maximum of 3,500 calories a week. It is not essential that you do so with one continuous during your daily workout. You can divide this up throughout the day. The important thing is to exercise on a regular basis, 5-7 days a week. Exercising to the point of expending much beyond

3,500 calories a week increases your risk that oxidative stress may outweigh the anti-aging benefits of exercise and cause accelerated aging. Limiting heavy intensity workouts to less than 90 minutes will minimize your risk of oxidative stress.

How Many Kilocalories Each Activity Uses	
Activity	**Kcal Used Per Minute**
Walking for pleasure	3.5
Bicycling for pleasure	4
Swimming, slow treading	4
Conditioning exercises, slow stretching	4
Home care, carpet sweeping	4
Raking lawn	4
Walking briskly	4-5
Home repair, painting	4.5
Mowing lawn, walking behind power mower	4.5
Racket sports, table tennis, doubles tennis	5
Golf, pulling cart or carrying clubs	5.5
Conditioning exercise, general calisthenics	6
Fishing in stream	6
Ice (or roller in-line) skating	7
Soccer	7
Moving furniture	7
Conditioning exercise, stair stepper, ski machine	7
Singles tennis, racquetball	7-8
Running	8
Basketball - game play	8
Cycling, fast or racing	10
Squash	12
Canoeing or rowing in competition	12

Modified from Ainsworth, B.E., et al., "Compendium of Physical Activities: Classification of Energy Costs of Human Physical Activities." Medicine & Science in Sports and Medicine, 1993; 25: 71-80

It is never too late to exercise. Unless we take some action to the contrary, the older we become, the less physically fit we become. Significant loss of muscle strength and function is called sarcopenia. Muscles weaken and shrink; we begin to lose our sense of balance; we often walk in a slow, shuffling, unbalanced fashion; it becomes harder to breathe. Without regular exercise, the decline of physical fitness with aging begins in the thirties and progresses steadily thereafter. Sarcopenia doesn't occur suddenly and is not limited to the very old. It is a gradual wasting away of the body over the course of decades. Muscle atrophies at a rate of about 6.6 pounds per decade of age past 20 years old if not exercised. The rate of loss accelerates after age 45. From age 20 to 70, we lose nearly 30% of our total number of muscle cells. By the age of 80 years old, there is an estimated 50% reduction in muscle mass. Moreover, with age the muscle

cells that remain start to atrophy. However, sarcopenia is not a necessary component of aging. The important thing to keep in mind is that severe physical decline does not have to happen to you. Much of the loss of muscle as you age is preventable - and even reversible. A fitness trainer put it this way: “It’s never too late to start. But it is always too early to quit.”

Physical activity must be frequent, intense, and/or of long duration – preferably frequent and intense – in order to exert cardiorespiratory benefits on sedentary individuals. In 2006, the American Heart Association and the American College of Cardiology recommended all adults engage in moderate-intensity aerobic exercise between 30 and 60 minutes a day, for a minimum of five days a week. Moderate-intensity exercise is defined as any activity that raises heart rate to 45-55% of your maximum heart rate (see below for determination of your maximum heart rate). Unfortunately, exercising at a moderate intensity only three or four times a week provides suboptimal, limited cardiorespiratory benefit. High-intensity exercise requires achieving a heart rate of at least 65-85% of your maximum rate.

Low-frequency exercise is physical activity occurring 3-4 times a week. High frequency means exercising 5-7 times a week. The duration is the length of time spent on an exercise. The minimum is whatever you are able to tolerate - even if it is only 5-10 minutes. Fortunately, multiple short intervals during a day provide a cumulative benefit; three 10-minute sessions can offer a substantial share of the benefit obtained from one 30-minute session. In general, for resistance training and cardiovascular training, 30-90 minutes is a reasonable and necessary duration, depending on your level of fitness and your fitness goals.

Exercise for Individuals with Medical Conditions

Diabetes

Until recently, some medical professionals believed that individuals with diabetes mellitus should not engage in exercise programs because of the risk of hypoglycemia. This notion has been proved false by many studies, including one demonstrating that men with type II diabetes who did not exercise were more likely to die during a 12-year period than their more active, physically fit counterparts. Exercise improves peripheral insulin sensitivity and even insulin binding, resulting in enhanced glycemic control. These improvements, however, disappear a few days after exercise is discontinued, so if you are diabetic you must realize that exercise needs to be fully incorporated into your life and activities.

Individuals with uncontrolled diabetes should not begin an exercise program until their blood glucose levels are stabilized. In addition, individuals with diabetic complications such as proliferative retinopathy, nephropathy, and peripheral or autonomic neuropathy should refrain from certain types of strenuous or high-intensity exercising. (For more information, see the American Diabetes Association’s guidelines for exercise).

Blood Glucose Levels and Exercise Advice in Type II Diabetes	
Blood glucose level	**Advice**
>300 mg/dl (and no ketosis)	Cautiously exercise
>250 mg/dl (with ketosis)	Do not exercise
100-180 mg/dl	Optimal range for exercise
<100 mg/dl	Consume small amount of high-glycemic carbohydrates before exercise

Insulin-dependent diabetics may note some reduction in their insulin requirements when they start an exercise program. Blood glucose levels should be monitored closely when initiating an exercise program.

Arthritis

Contrary to many beliefs resistance training does not cause arthritis. Instead, stronger muscles may actually ease the strain - and thus the pain and stiffness - associated with arthritis. Numerous studies have shown that strengthening the quadriceps muscle can reduce knee pain and disability associated with osteoarthritis. Physical inactivity actually increases arthritic problems. Exercise programs for arthritis should include stretching, aerobics, and resistance training. Some initial increased soreness may be expected for a time after beginning an exercise routine. It is important to stick with a program, as it may be at least 2-3 months before arthritis pain relief is experienced. By this time, significant benefits are likely to be seen, in both pain reduction and flexibility.

Osteoporosis

All forms of exercise are beneficial for individuals with osteoporosis, but resistance training is of particular value. Resistance training makes bones stronger, improves balance and reduces the risk for falls, and increases both muscle strength and mass. Numerous studies have documented improvements in bone mineral density following regular resistance training. Exercise can have as great an impact on bone density as taking a drug like Fosamax. Exercise can prevent or slow bone-weakening osteoporosis and can lower the risk of falls, which can cause hip fractures and other injuries. The National Osteoporosis Foundation recommends weight-bearing activities for 45-60 minutes, 4 days a week. In a study comparing a walking program with resistance training in menopausal women, the researchers found that the women in the walking group continued to lose bone-mineral density while the women performing resistance training did not. Because bone mass decreases when exercise stops, it is important to make exercise a lifetime commitment.

Mindful Exercise

Elite athletes don't rely solely on physical training, genetics or coaches to get them to the top. They include rigorous psychological exercises for mental preparation. "When physical skills are evenly matched - as they tend to be in competitive sport - the competitor with greater control over his or her mind will usually emerge as the victor," say Steve Backley, Olympic athlete in his book The Winning Mind. The move from

average to better-than-average requires mindfulness; focused attention and clear intention in all actions.

Mindful exercise is about connecting your mind and body. Use your mind to listen to what your body is telling you during exercise. Diverting your attention by watching the television or reading while exercising prevents full and complete attention to your workout. It may be helpful to have some background music, but it should not be where your mind is focused. Here are a few ways to create a mindful approach to exercise in your life:

- Focus on the here and now. If your mind is elsewhere, you are missing a significant opportunity to realize maximum gains. Be in the moment. Be in your body. Begin by focusing on your breathing first, then your posture. Assess your form and technique, particularly when you begin to tire or feel fatigued. Listen to and feel your heart beat. Notice how your muscles, tendons and joints feel with each workout.
- Learn to relax. Use self-talk to tell yourself to "Be calm." Practice relaxation techniques during recovery. Breathing techniques are among the most valuable. Tense, tight muscles will fatigue you more quickly, cause avoidable pain, and minimize your efficiency.
- Adjust your attitude. An attitude that is not open and accepting, or that is filled with judgment places obstacles in your way.

Starting to Exercise

- Consider whether you need a pre-exercise medical exam. If you have chronic health problems or you are over the age of 50 and have not been exercising regularly, get medical clearance before starting an exercise program.
- Exercise increases cellular metabolism and oxidation. The buildup of oxidants can cause cellular damage, particularly to DNA. Oxidative damage may be lessened by taking vitamins C and E regularly. Consider taking those two vitamins about 1-2 hours before you exercise.
- Start slowly. Don't overdo it. If you have not exercised in a while, just go for 5-15 minutes at the beginning.
- Do a little more each week. Try to build your workout by a couple of minutes each week. Aim to increase the duration of your workout by 10% a week.
- Warm up first, then stretch, and stretch again after your exercise.
- Visualize. Imagine yourself doing your sport or activity. Make a picture in your mind of lifting the barbell with perfect technique or running in perfect form. Imagine how your body would move.
- Learn to listen to your body, and treat yourself right. If it hurts, slow down. If it feels good, do more than you planned.
- Take a lesson. Even if you don't normally work out with a trainer or a pro, treat yourself to an hour or two with an expert who can show you how to maximize your workout and avoid needless injuries.
- Cross-train. Try to plan your workout schedule around a number of different activities, such as walking, biking, and swimming. Rotate your activities on different days. Vary the exercise pattern. Avoid doing the same activity every

single day, and certainly not more than two days in a row.

- Vary your workout pace. Do more on some days and less on others.
- Don't let yourself get dehydrated. Drink water. Every 10-15 minutes, take a break and drink half a cup or more of water.
- Exercise with a friend. You'll encourage each other and push yourselves to meet your goals.
- Use an Exercise Log. This will become one of your most useful tools for achieving maximum results for your effort. Studies demonstrate that exercisers who regularly log workouts are more successful and much more likely to stick with an exercise program. A log is a fantastic feedback tool; measurable progress is a great motivator. An exercise log is meant to document your exercise program, problems and progress. Even if you work with a personal trainer, remember that only you are responsible for yourself. Personal trainers generally maintain a progress log for you, but keeping your own will help you assume responsibility. It will help you better understand what is going on with your program. Use the log to challenge yourself and your trainer.
    - Use the log to plan your workout. Don't walk into the gym without determining in advance what you intend to do and how you plan to accomplish it. Prior to a resistance training session, determine which major muscle groups you will train and write down each exercise you plan to do. You may decide to pre-determine the weight you will use, and how many sets you plan to perform. Do the same before cardiorespiratory workouts. Challenge yourself.
    - Rate your effort after each workout
    - Make note of problems, pain or injury. Glancing back at these notes before the next workout will help you prevent further injury or pain
    - Use the log to assess what routines work and which ones are less effective
    - Assess whether you are ready to increase the amount of resistance, the number of repetitions of an exercise or the duration of a workout.
    - Assess whether you need to change your routine. Muscles adapt to the same exercise over time. Mixing up the type of exercise periodically will avoid adaptation and yield better results
    - Even if you work with a personal trainer, who probably maintains a log for you, keeping your own log will benefit you. Remember, only you are responsible for your health, not your trainer.
    - Exercise logbooks are available at most bookstores, sporting goods stores and gyms.
- Reward yourself. Set goals and when you achieve them, treat yourself. Buy a new pair of shoes or get a massage. Celebrate your age reduction!

Three forms of exercise, when performed regularly, can significantly diminish your chances of developing an aging-related disease, or if you are already suffering from one, may help reduce the debilitating symptoms. The three forms of exercise are flexibility workouts aimed at your muscles and tendons, aerobic or endurance forms of exercise aimed at your cardiovascular system, and strength-building resistance training.

Exercise sub-types include core-body, balance, and coordination exercises.

Flexibility Exercise

The contribution of good muscular flexibility to overall fitness and preventive health care is frequently underestimated. Flexibility is the ability of a joint to move freely through a full range of motion. Too little activity allows muscles to shorten and the joint connective tissue (tendons and ligaments) to weaken. The result is that general stiffness many of us feel. Diminished flexibility reduces joint range of motion. Joints with limited mobility are at greater risk for injury. Arthritic or degenerating joints experience greater pain with limited mobility. Approximately 80% of all low back problems are due to improper alignment of the vertebral column and pelvic girdle - a direct result of inflexible and weak muscles. Stretching is a way to combat these degenerative effects. Stretching is relaxing, mentally as well as physically. Stretching also improves circulation by increasing the surface area of muscles. Moreover, it increases cellular regeneration.

Tips for Flexibility Exercising

- Warm muscles respond better than cold ones. Always warm up 5-10 minutes, prior to stretching. Like taffy, muscles stretch better when warm.
- Stretch slowly. Avoid abrupt, quick movements.
- Stretch as far as your agility allows. Try to perform as complete a movement as possible, even if it's difficult for you.
- The intensity of stretch should be only to the point of mild discomfort. Excessive pain is an indication that the load is too high and may cause injury.
- Each stretch should be done 2-4 times.
- Flexibility exercises should be conducted 5-6 times a week in the early stages. After at least 12 weeks, flexibility levels generally can be maintained with only 3-4 sessions a week.
- Hold the final position for each stretch 20-30 seconds. As flexibility increases the time each repetition is held may be gradually lengthened to a maximum of 1 minute.
- Always keep your back as straight as possible. Back flexion can trigger injury.
- Don't stretch if you feel a sharp pain. Stop and give the aching muscle a couple days of rest.
- A 5-minute cool-down at the end of an exercise session is crucial, especially for people over 40. Ceasing exercise abruptly is bad enough but it is made worse by sitting or lying down immediately, or by taking an immediate hot shower, hot tub, sauna, or using a steam room. If you must shower soon after exercise, make sure the water is cool or lukewarm.

Stretch to Live Younger

Nine basic stretches are described at the end of this chapter. All major joints should be flexed routinely. There is nothing fast about this form of movement.

Cardiorespiratory Exercise

Aerobic activities such as rapid walking, jogging, dancing, and hiking increase overall endurance or cardiorespiratory fitness, but not strength. Aerobic training requires oxygen as its primary catalyst for energy production. Effective aerobics increases your heart rate and promotes greater amounts of oxygen to flow through your body thereby improving circulation. Older people can increase general physical fitness - that is, their heart and lung fitness - with regular aerobic exercise. Quite often, the improvements exceed those seen in younger adults. Aerobic activities are safe for most older people; cause few injuries, and even fewer major adverse health consequences. Furthermore, it doesn't take long to see positive results. Always consult with your physician before beginning cardiorespiratory exercises if you have not been doing them regularly, if you have chronic medical problems, if you are a male over the age of 40 or a female over the age of 50.

There are basically two types of energy systems that the body utilizes, aerobic and anaerobic. Each energy system produces adenosine triphosphate (ATP), which is used by the muscles to contract. Aerobic metabolism is the production of adenosine triphosphate (ATP) from glucose, protein or fat as long as oxygen is present. The byproduct of this system is heat, water and carbon dioxide. Anaerobic metabolism can only utilize carbohydrates for ATP production. The system does not use oxygen in the metabolism of its fuel source. A byproduct of the metabolism of glucose in the system is heat and lactic acid, the cause of muscle soreness immediately after exercise. Muscle soreness 24 to 48 hours after exercise is due to torn muscle fibers and connective tissue.

ATP is ultimately the body's only energy source required by cells to survive and function. The aerobic energy system supplies all of the energy your body needs while at rest and during low- to moderate-intensity exercise. The anaerobic system provides a short duration (45 to 70 seconds) and high power. The more aerobically fit you become, the more you will be able to produce ATP aerobically at higher exercise intensities. That means you will go faster with less pain and energy. You will use proportionally more fat to produce ATP compared with untrained individuals. At rest, the untrained person derives about half of the energy used to make ATP from fats, while a highly trained athlete uses nearly 70% fat for ATP production.

Another benefit of achieving a high level of fitness is that your trained muscles learn to convert lactic acid (a byproduct of anaerobic glycolysis) into usable energy. This allows you to delay or even avoid the buildup of lactic acid and the resulting muscle fatigue and soreness. In addition, regular high-intensity aerobic exercise elevates your anaerobic threshold, the point at which the body can no longer meet the oxygen demand for producing ATP and your muscles start producing lactic acid. Because the greatest amount of ATP is generated in the presence of oxygen (during aerobic metabolism), the higher your anaerobic threshold, the more ATP you can produce at a higher workload - and the longer you can maintain high-intensity exercise. This point varies on an individual basis and is dependent on fitness level. For healthy individuals, this occurs between 50% and 66% of their maximal working capacity. This would be equivalent to

running faster than half speed. Finally, aerobic exercise results in persistent long-term release of growth hormone in the plasma for 2 hours or even longer after you exercise. Moderate intensity aerobic exercise may be sufficient to cause maximal stimulation of growth hormone release.

Aerobic capacity is the ability of the body to collect and transfer oxygen from the air through the lungs and blood to the working muscles. This is related to cardiorespiratory endurance and is referred to as maximal oxygen consumption or VO2max. Aerobic capacity reduces at about 10% per decade after 30 years of age.

METs

In contrast to your overall fitness level, the goal of stamina exercise is not the expenditure of calories per se, but an increase in your metabolic rate, or the amount of oxygen that your muscles consume during exercise. MET is the standard metabolic equivalent, used to estimate the amount of oxygen used by the body during physical activity. One MET (metabolic equivalent units) represents the energy (oxygen) used by your body as you sit quietly, your metabolic rate at rest. The harder your body works during activity, the higher the MET. Any activity that burns 3-6 METs is considered moderate-intensity physical activity. Any activity that Burns more than six METs is considered vigorous-intensity physical activity. The long-term goal should be to reach at least 10 METs for at least 60 minutes a week if you are a woman and at least 11 METs for at least 60 minutes a week if you are a man.

If you do something that burns more than 600 calories an hour then you are somewhere close to 10 METs. You should try to exercise at this rate for no less than twenty minutes three times a week. More is better. Another good way to estimate METs is by 'sweat time' - exercise at an intensity where your body sweats for at least 20 minutes or more three times a week. The amount of time you spend actually sweating provides a rough indication you have reached 70% of our maximum heart rate and metabolic rate.

Maximum Heart Rate (MHR)

Another way to estimate METs is with your heart rate. To get the most out of cardiorespiratory exercise, your heart rate should increase to within 65-85% of the potential maximum heart rate (this is known as your target heart rate, described below). Maximum heart rate can be estimated using an age-dependent formula to predict maximum aerobic capacity during peak exertion:

Your Maximum Heart Rate = 220 minus your age (in years)

Never exercise at or above this level. Remember, drugs, coffee, illness, and alcohol can push the heart rate to dangerous levels. The simplest way to measure your heart rate is to count your pulse for ten seconds, and multiply it by six. A more reliable and accurate method to monitor your heart rate is with a heart rate monitor, which you can purchase at a sporting goods store. The better heart rate monitors strap around your chest to detect your heartbeats.

Resting Heart Rate (RHR)
Heart rate (number of beats per minute) is an accurate measure of your performance during the aerobic session. However, it is not the only indicator of your fitness level. The resting heart rate needs to be determined, particularly if you plan to use the Karvonen method of determining your target heart rate (see below). The resting heart rate is determined as follows: Record your heart rate (beats per minute) for three consecutive mornings before you get out of bed. Your resting heart rate is the average of the three readings. This may not be reliable if you take medication that can affect your heart rate, such as a beta blocker. As your cardiovascular system becomes stronger, the resting heart rate will become lower. You will then need to repeat the above measurement.

Heart Rate Reserve (HRR)
The heart rate reserve is used to calculate your target heart rate by the Karvonen method.

Heart Rate Reserve (HRR) = Maximum Heart Rate (MHR) - Resting Heart Rate (RHR)

Target Heart Rate (THR)
The target heart rate is a heart rate range you should try to maintain during exercise. Heart rate should be measured every 15 to 20 minutes for experienced exercisers and every 5 to 10 minutes for beginners. Note that beta-blocker medication lowers the overall heart rate. Raising your arms overhead produces a higher heart rate known as the pressor response. If your heart rate is too low, use full range of motion and more arm movement. Conversely, if your heart rate is too high shorten the range of motion and reduce or eliminate arm movement.

There are two methods to determine your target heart rate. The Standard Method is simple to determine. Target Heart Rate by this method requires exercise at intensity between 60% and 90% of your maximum heart rate.

Standard Target HR = % Intensity/100 x (Maximum Heart Rate)

The Karvonen Method incorporates your resting heart rate and is therefore the more accurate method. Target Heart Rate by this method requires exercise at intensity between 50% and 85% of your maximum heart rate.

Karvonen Target HR = (% Intensity/100 x (Maximum HR-Resting HR)) + Resting HR

Your fitness level will determine which of the three intensity levels – Beginner, Intermediate or Advanced – should be maintained. For each category, approximately 4 - 6 weeks should pass before moving to the next level, assuming at least three aerobic sessions per week.

Target HR	Beginner	Intermediate	Advanced
Standard Method	60% - 75%	75% - 85%	80% - 90%
Karvonen Method	50% - 65%	65% - 75%	75% - 80%

If you need to lose excess body fat, you may find consider alternative exercise – more frequent and longer duration sessions, but at a somewhat lower level of intensity. The idea here is to exercise aerobically 6-7 days/week (rather than 3-5 days/week) for 45-90 minutes (rather than 30-60 minutes) at an intensity of around 65-70% rather than 70-85%, based upon the Standard Method of your maximum heart rate (or 55-65% with the Karvonen Method). With this approach, a slightly greater percentage of the overall calories you burn are derived from fat stores, than when exercising at a higher intensity. But because you are burning fewer calories overall at a lower level of intensity, you must compensate by exercising longer and more often. If you are up to it, or if time is more limited, I suggest working in the target heart rate ranges listed in the table above. While the ratio of fat burned is very slightly lower when training at a higher level of intensity, this is more than offset by the fact that you are burning more calories overall. More importantly, chronic changes in the metabolic processes occurring in your body that result from exercise play a much greater role over time than how much fat or how many calories are burned during your workout. Increasing the efficiency of oxidation through aerobic threshold training increases fat burning when working out and at rest. When you have trained at aerobic threshold you will effectively burn more fat while you train, and even while you sleep. If weight loss is not one of your goals, then exercise aerobically 30 – 60 minutes 3-5 days/week in the range appropriate for your fitness level (see table above).

If you have not exercised for some time begin by walking 10-15 minutes per day. Gradually increase to 30 minutes per day. If your schedule permits, try walking for 1 hour per day. Once you are in a routine of walking daily, increase your pace, so that your heart rate is elevated to at least 65% of your maximum heart rate (Standard Method). Other aerobic exercises include distance running, stair climbing, skating, spinning, treadmills, Nordic tracks, swimming, and basketball.

Space your workouts during the week. Exercise at least every other day or switch between types of exercise or sports. By the time you are fully conditioned you may be exercising aerobically up to 5 days a week.

If you like walking for exercise but the weather is bad, consider a shopping mall. Some 2400 malls nationwide let walkers in before shopping hours, usually between 6:30 and 10 A.M. In fact, many have walking clubs. Additionally, many health clubs have indoor tracks if treadmills are not your thing.

Recovery Heart Rate

The heart rate should be below 120 after two to five minutes after exercise stops, depending on your fitness level. If your heart rate is higher, insufficient cool-down or low fitness level may be the cause. Slow heart rate recovery can also be due to illness or exercising too vigorously. Final heart rate check at the end of the aerobic workout

should be below 100 beats per minute.

Rating of Perceived Exertion (RPE)
Generally, if you can't talk during exercise, you're training too hard. However, a more accurate method of measuring exercise intensity is the Rating of Perceived Exertion. To put it simply, imagine a scale of six to 20 and try to determine where your intensity level is on that scale. That number will be very close to your heart rate. This method should not replace direct heart rate measurement due to inherent inaccuracy but serve as an adjunct to it.

Mindful Running
Remember, mindful exercise is about connecting your mind and body. Use your mind to relax your body, and listen to what your body is telling you. The goal is to relax muscles, opening tight joints, and use gravity to do the work. Here's how to start:

- Let your mind perform the bulk of the work. Use your mind to focus and listen to your body. Your mind instructs your muscles to start working or relaxing. Start out slowly, and seek to find the perfect tempo for you. Take in the beauty of your surroundings so that you finish relaxed, and full of energy. When you begin running, your mind must also push against the body's natural resistance.
- Pay close attention to what your body is doing. Practice listening to any subtle changes that you can detect. Feel your feet hitting the ground. Feel your posture. Feel your joints. Are there subtle changes you should make? Work on developing a sense of your body.
- The more efficiently your body can take in oxygen, the easier running will feel. If you're not breathing deeply into your lower lungs, you're not getting as much air as you could -- a common problem when people begin running. To belly-breathe, stand or sit and place your hands over your belly button. Now purse your lips as if you're trying to blow a candle out, and exhale, emptying your lungs by pulling in your belly button toward your spine. When you've blown out as much air as you can, relax your belly and the inhale will occur naturally. Practice breathing out for three steps, and breathing in for two steps. Try matching your breath with your cadence when running.
- Tight muscles can't get the oxygen they need. When muscles are loose and relaxed, the oxygen carried in your blood can enter the muscle cells much more easily. The solution is to relax. Don't take yourself so seriously. Drop your shoulders. Smile. Relax your muscles. Lighten up.
- When your posture is correct, energy flows through your body more freely. Running with your posture out of alignment creates tension and fatigue. Your aligned body has a centerline that runs from head to foot. Stand in front of a mirror. Straighten your upper body. Then look down at your feet. If you can see your shoelaces, you are in proper alignment. Memorize how this feels. Practice it.
- Practice your posture. Feel yourself standing in a straight line. Try to keep your posture line straight while on one foot a time. Start to jog slowly. When one foot hits the ground, feel it hitting at the bottom of your posture line. Practice moving from one foot to the next. Speed is not a factor here; that's the very last thing

you should think about. Work first on form.

- Studies show that when athletes dissociate, when they wear a walkman while running, they don't do as well. Many runners want to think of anything but the running. But our thoughts literally change our physiologic reactions. Our thoughts are performance cues. When you do positive self-talk, you perform at a higher level.
- Set short-term and long-term goals. Plan to run, but take walking breaks. Example: Decide to go three miles, regardless how many times you walk, how many you run. Alternatively, set one lap around the block as your goal. Set small goals that are concrete, attainable, and realistic. Set dates for achieving them.

Mindful Walking

- The surgeon general recommends moderate amounts of activities such as a brisk walk of at least 30 minutes a day every day for overall health. The Institute of Medicine encourages healthy adults to exercise at a moderate intensity for an hour every day. People looking to lose weight are encouraged by the American Association of Retired Persons to walk at least an hour a day for most days. For heart, lung, and circulation health, the American Heart Association suggests 30 minutes of vigorous activity (including walking) a day, three to four times a week. Many of these guidelines allow time requirements to be non-continuous, with bouts of physical activity sprinkled throughout the day.
- On a scale of 1 to 10, with 1 meaning relaxed and 10 thoroughly exhausted, start your walk at level 2 or 3, working up to level 6 to 8, and then cooling down to a 2. As you get more and more fit, you actually end up having to walk faster or steeper to keep that 6 to 8 up.
- It's best to have your elbows bent at a 90 degree angle, with arms swinging freely so that they come up to about chest level, your fingers curled into a loose fist, and feet moving forward at a brisk pace. If your hands are just dangling at the sides, you're probably not walking fast enough to get any heart rate increase.
- Many guidelines give recommendations on time and intensity, so distance may not necessarily be a factor. On the other hand, some walking events and campaigns with specific distance requirements have been known to be very motivating. For example, some people love digital pedometer programs, which enable you to keep track of steps during the day. Volkssporting groups have also given honors to walkers of all ages that have achieved particular distances.
- Putting one foot ahead of the other may yet be the easiest form of exercise because it can readily be incorporated into daily life. Various sources, including the AHA, the AARP, and the NASPE, offer the following tips:
    - At Home
        - Go out for a short walk before breakfast, after dinner, or both
        - Walk to the corner store instead of driving
        - Instead of asking someone to bring you a drink, get up off the couch and get it yourself.
        - Walk instead of watching TV
        - Walk to see the neighbors

        - Walk the dog
    - At Work
        - Take the stairs instead of the elevator. Or get off a few floors early and walk the remaining flights
        - Walk down the hall to speak to someone at the office rather than using the telephone
        - Conduct a meeting with co-workers while taking a walk
        - Walk around your building for a break during the workday or during lunch
    - Out and About
        - Get off a stop or two early on the bus or subway, and walk the rest of the way
        - Park farther away at the shopping mall, and walk the extra distance
        - Walk around while waiting for a relative or friend's game to begin
        - Walk while waiting for the plane at the airport
        - See the sights in new cities by walking
        - At the beach, sit and watch the waves instead of lying flat. Better yet, get up and walk, run, or fly a kite
        - When golfing, walk instead of using a cart

Interval Training

Lack of time is the number one reason people give for not exercising. Moreover, lack of results once they do start exercising isn't far behind. Interval training is a potential solution for both of these common problems. In general, interval training should not be started until you are used to some level of continuous training first.

Interval running enables you to improve your workload by interspersing heavy bouts of fast running with recovery periods of slower jogging. For example, you might run hard over any distance up to 1 kilometer and then have a period of easy jogging. During the heavy interval, lactic acid is produced and a state of oxygen debt is reached. During the recovery interval, the heart and lungs remain stimulated to replenish the debt by supplying oxygen to help break down the lactates. The stresses put upon the body cause an adaptation including strengthening of the heart muscles, improved oxygen uptake, and improved buffers to lactates. Your heart must overcome a greater resistance, which leads to improved venous return and greater ventricular filling and contractility. Your heart experiences a more complete emptying, which increases your stroke volume and cardiac output. All this leads to improved performance, in particular within the cardiovascular system.

The benefits continue after your workout. Interval training allows you to perform more work, which increases your Excess Post Oxygen Consumption (EPOC). EPOC, the “afterburn,” is the absolute number of calories you consume, long after you have completed your workout.

The intensity (or lack thereof) of each interval is up to how you feel and what you are trying to achieve. The same is true for the length of each interval. For example, if it is

your habit to walk two miles per day in 30 minutes, you can easily increase the intensity of your walk (as well as up its calorie-burning potential) by picking up the pace every few minutes and then returning to your usual speed.

There are two levels of interval training. Aerobic interval training involves an intense level for 3-5 minutes, at 75-85% of maximum heart rate. This is followed by a recovery period lasting the same duration, but at 50-65% of maximum heart rate. Anaerobic interval training provides an even more intense workout. With this exercise, a high intensity, at 90-95% of maximum heart rate, is maintained for 30-90 seconds. This is followed by a recovery three times longer, and at 50-65% of maximum heart rate. Generally, about 5-10 intervals will provide a sufficient workout. When starting interval training, begin with shorter intervals and gradually work up to longer intervals as your level of fitness improves.

Precautions for safe interval training:

- Get medical clearance from your physician if you are not used to running or are not in good condition
- Warm up before starting intervals
- Set training goals that are within your ability
- Start slowly. (for example: walk 2 minutes/ run 2 minutes) In general, longer intervals provide better results
- Keep a steady, but challenging pace throughout the interval
- Build the number of repetitions over time
- Bring your heart rate down to 100-110 beats per minute during the rest interval
- To improve, increase intensity or duration, but not both at the same time
- Make any changes slowly over a period of time; no more frequently than every 2 weeks
- To ensure even effort with interval training, train on a smooth, flat surface
- Circuit training can provide an alternative form of interval training

Resistance Training

Weight training can make a tremendous difference in older people's strength and overall ability to function even the "oldest-old" will respond well to resistance training. In general, the harder you work the greater the gains.

Resistance training increases the size and strength of muscles without improving endurance

Weight training can help you lose weight. By turning up the metabolism of your muscles, you burn more calories. Additionally, pound-for-pound, more calories are burned to maintain muscle than fat. On average, one pound of muscle requires 35-75 calories per day just for maintenance, compared to less than 3 calories per-pound per-day for fat. Muscles well conditioned aerobically will burn closer to 75, because the number of mitochondria is the determining factor. If you do strengthening exercises regularly your body will burn more calories all day long, even when you're at rest. If you need to lose weight then resistance training is essential.

Weight lifting has more benefits. It can help reduce depression in older people. Strengthening exercises are especially important to women. To protect bone mass and density, women need to lift weights even more than men do. Furthermore, muscle fibers are lost with age if not used regularly. Even marathoners lose muscle if they don't do strengthening exercises. By modifying your lifestyle through resistance training, diet, and natural hormone replenishment therapy, you will slow or even reverse the loss of muscle fiber.

Resistance training is a form of anaerobic exercise. Unlike aerobic training, where the primary energy source is oxygen, the anaerobic training energy source is a system known as the ATP/CP (Adenosine Triphosphate and Creatine Phosphate) system. Lactic acid is produced during resistance training, which causes the characteristic burning sensation in muscles after repeated heavy use. Lactic acidosis is the excessive amount of acid accumulation that occurs when people are not able to meet their energy needs by aerobic metabolism. The tendency to develop lactic acidosis increases with age, obesity, disease, nutrient deficiencies and with hormonal deficiencies.

For someone who is in fairly good shape physically, adaptation to the physical stress caused by resistance training usually takes 2 weeks. For someone, who is not well conditioned, adaptation can take up to 6 weeks. The critical factors to consider with weight training are frequency, intensity, and duration.

Muscle Fiber Types

There are two types of muscle fibers, fast twitch and slow twitch. Fast twitch fibers are used for explosive type movements and are easily fatigue. Slow twitch muscle fibers contain more mitochondria than fast twitch. Mitochondria are cell structures that contain specific enzymes, which are required by the cell in order to use oxygen for energy production. Fast twitch muscle fibers have fewer mitochondria, and therefore less capacity for oxygen utilization in the production of energy within the muscle. This makes them better suited to anaerobic activities such as weight training, sprinting, jumping and other explosive type activities. Fast twitch fibers create energy anaerobically, that is, without oxygen. This system uses glucose or fat in combination with oxygen to produce energy.

Each person has a specific ratio of fast twitch to slow twitch fibers. A person with a high ratio of fast twitch fibers may find it easier to train for specific activities that involve explosive movements. Conversely, a person with a higher ratio of slow twitch fibers might find it easier to train and excel at endurance type activities.

There is a third type of muscle fiber that exists only in humans. It is considered a fast twitch fiber of type IIA. These fibers are less powerful than the type IIAB discussed above. What makes these type IIA fast twitch fibers unique is that they can adapt somewhat to aerobic activities. These fibers provide the capability to alter our original genetic fast twitch to slow twitch ratio.

Guidelines for Various Strength-Training Goals						
Training Goals:	**Endurance**	**General Fitness**	**Hypertrophy**	**General Strength**	**Maximal Strength**	**Explosive Strength**
Sessions per week	3-6	2-3	3-6	3-4	3-4	2-5
Repetitions	≥ 15	12-15	8-12	6-10	4-6	1-5
Sets per Exercise	2-4	1-3	3-6	3-5	3-5	3-8
Exercises per Region	1-3	1-3	3-4	2-3	1-2	N/A
% of 1 RM	55-60%	60-70%	70-80%	75-85%	85-90%	85-100%
Muscular Fatigue	Low-Mod	Moderate	High	Mod-High	Mod-High	Low-Mod
Rest between Sets (min.)	1-2	1-2	1-3	2-3	3-5	3-8
Fiber Recruitment (Primary/Secondary)	Type I	Type I/IIA	Type IIA/I	Type IIA/I	Type IIB/IIA	Type IIB

Frequency of Exercise

Weight training must be done regularly for maximum benefit. Muscles lose strength far more rapidly than they gain. Two training session per week during the first 2 weeks are sufficient to increase muscular strength and endurance, but in future weeks, much better results will be obtained from 3 weekly sessions. It is very difficult to achieve most fitness goals from only 2 sessions per week. It is nearly impossible to realize meaningful gains by exercising a muscle less than twice weekly. Any growth resulting from a workout will be mostly lost if it is not built upon within a matter of days. Training sessions more frequent than 3 times per week may result in additional, but diminishing gains. The risk of more frequent sessions is injury, inadequate recovery time and burnout (discussed later). Muscles require recovery time for repair and growth. Allow 48 hours of recovery time between workouts.

Intensity of Exercise

Exercise intensity is a combination of the weight load (measured as a % of your maximum strength capacity, or 1-Repetition Maximum) and the number of repetitions and sets completed. Your long-term goal is to work your muscles at an intensity level to cause failure of the muscle by the end of a set. This is a crucial factor for adding maximal lean body mass and increasing your strength. During the first 4-6 weeks of training, however, beginners do not need to work to complete muscular failure. During subsequent sessions, try to reach failure with each set for at least two training sessions per week. If you feel the need to go a little lighter one day per week, that is okay

To improve strength in young people to any worthwhile degree, they must lift 60 -100% of their maximal capacity. Studies have shown that loads under 60% are generally ineffective at increasing muscle strength. Research has demonstrated the safety and benefit of older individuals training at the same level. Maximal capacity (also called 1 Repetition Maximum, or 1 RM) is defined as the most weight a person can lift with one single movement - repetition - or muscle contraction. It is a weight so heavy that the person cannot lift it again without resting for a while. For example, if you can perform

only one repetition of a biceps curl exercise with a 30-pound weight, then your 1-repetition maximum for that muscle is 30 pounds. In this example, exercising your biceps muscle using a weight of less than 60% of your maximal capacity (30 pounds), or 18 pounds, would result in minimal improvement in muscle strength. On the other hand, injuries become more likely using greater than 80% of the maximal capacity (30 pounds), or 24 pounds.

Research indicates that reaching complete muscle failure within the following range of repetitions correlates well with predictable percentages of maximal capacity:

Maximum reps completed before muscle failure	= % of Maximal Capacity (% of 1-RM)
15	65%
12	70%
10	75%
8	80%
6	85%

Each lift, or muscle contraction, is called a “repetition.” A series of repetitions is called a “set.” A complete workout consists of one or more sets for each muscle group. Most resistance-training routines call for 1-20 repetitions per set, and 2-4 sets of each exercise. In the first 4-6 weeks of training, 1-2 sets per exercise will bring about a positive change because most gains are neurological. A third set should be added after this stage. Every 2 weeks you should determine whether you are able to increase either the number of repetitions per set or the weight resistance by a small amount for each exercise. Make small increases, no more than 5-10%. As one increases in years of weight training experience, more sets may be needed to break plateaus of size and strength.

If you are a female, don’t worry that resistance training will give you muscles as large as a man’s; it just won’t happen. Testosterone is the hormone needed for a muscle to reach very large size and women have only a small fraction of the testosterone level found in men. It is nearly impossible for a woman to become ‘overbuilt’ with resistance training. Women body builders who look as muscular as a man are taking steroids. Instead, you will develop a firm, leaner, well-defined shape. Adding lean body mass (muscle) increases your metabolism, making weight loss (fat) much easier. Also, your skin will become more taught, with less sagging. Firm muscles hold body fat closer to your body. Overall, you will not only feel better, but you will look fantastic.

Tempo

Use slow controlled movements rather than rapid bursts of motion. Slow speeds of movement increase the muscles time under tension, which aids in size and strength development. Aim for about 1-2 seconds contracting and up to 2-4 seconds releasing. High speed (1 - 3 seconds per repetition) or explosive resistance training using greater than 80% of 1-RM maximizes fast twitch type IIB muscle fiber recruitment. This is not

as effective for developing maximal strength because total time under tension is minimal.

If the goal is strength, a set should last no longer than 60 seconds. As the stress on the energy system becomes progressively more aerobic, and the muscle loses its ability to maintain high levels of muscular tension.

Recovery
Recovery time between each successive exercise set is an important part of achieving your fitness objectives.
General Recovery Rule:

- Higher # of repetitions/set = Lighter weights = Little rest (aerobic development)
- Moderate # of repetitions/set= Moderate weights = Moderate rest (hypertrophy)
- Lower # of repetitions/set = Heavier weights = Longer rest (hypertrophy/strength development)

Time of Recovery:

- 30 seconds = 50% recovery
- 60 seconds = 75% recovery
- 2.5 minutes = 95% recovery
- 5 minutes = 100% recovery

Generally, 30-120 seconds is recommended for recovery from an exercise set completed to muscle failure. A suggested recovery time for a moderate number of sets (8-12) is 60-90 seconds. Low repetitions (1-7) with much heavier weights may require lengthier recovery time, up to 2-3 minutes. High repetitions (> 12) with lighter weight require only 30-60 seconds recovery. If you alternate sets between two muscle groups you can save time, as the first muscle is recovering while you are exercising the second (see Super Set training below). Recovery between workout sessions is the time when muscle fibers undergo repair and growth. Allow 48 hours between workouts for the same muscle.

Duration of Exercise Session
For maximum benefit, plan on your workout lasting approximately 30 – 75 minutes, not counting warm-up, stretching and cool-down. This is based on an average workout routine consisting of 8-10 exercises, with 2-3 sets per exercise, and 1 minute recovery between sets.

Routines and Technique
Progression Principle:
Work the larger muscle groups first, then the smaller muscles. Your large muscles, like the upper legs and chest, use smaller muscles to some degree in the lift, and if you work the small muscles first, they'll be too fatigued to do their role in the lift.

The body has 6 major muscle groups: the chest, the back, the legs, the shoulders, the arms and the abdominal. Train each group regularly, to avoid imbalance.

Total Body Training:
Most people do a total body workout when they strength train, because it takes more workouts to perform split routines, which are best done over 4-5 days. When performing a total body workout select a minimum of 8-10 exercises that hit all of the major muscle groups. From a preventive-aging perspective, total body training is preferred to split training routines.

Split Training:
Split training is an advance, specialized workout in which 1-4 muscular regions are worked within one day. The purpose of split training is designed for the advanced exerciser who wishes to maximize development of specific muscular regions for the purpose of optimal hypertrophy or strength. The downside to split training is that only half the muscle groups are trained during a session, requiring more frequent training sessions. Examples of split training include:

- Upper-Lower – train muscles in the upper body one session, and alternating with lower body muscle training during the next session
- Push-Pull - train all upper and lower body muscles that are used to 'push' during one session, and alternating with upper and lower body muscles used to 'pull' during the next session

Mix it Up:
Consider rotating among 3-4 different exercises for a given muscle on consecutive workout days. This is important to avoid muscle accommodation to the exercise. Alternatively, choose one exercise for a given muscle and stick with it for 3-4 months before switching to another. The body needs to be exercised differently on a regular basis, rather than repeating the same routine over and over

Technique and Form:
Using proper biomechanics and appropriate body positioning, when performing resistance training, will protect your skeletal structure and create balance in the specific muscles being exercised. Perform each exercise through the entire possible range of motion. Attention to proper technique is as important for realizing maximal results as to avoid injury to muscle, tendons, and ligaments. If you have never been formally instructed in the proper form and technique for weight training exercises, seek the guidance from a qualified fitness trainer.

If you are unable to maintain proper form and biomechanics with each repetition, you are probably using too much weight. Good technique with a little less weight will yield far better results, without the risk of injury, than more weight with poor technique. Beginners should start with approximately 12-15 repetitions.

The following guidelines should be followed when lifting weights:

- Lift weights from the floor with your legs and not the back.
- Use a smooth full range of motion.
- Don't jerk the weights.
- Don't lock the knees (keep them slightly bent.).

- Don't put pressure on your teeth, the enamel can crack.
- Keep back alignment, don't hyper extend or flex the back.
- Don't chat with your buddy, concentrate on the task.
- Breathe on exertion. Unoxygenated muscles can cramp.

Breathe Naturally:
Exhale during the concentric phase (lifting or pushing he weight up) and inhale during the eccentric phase (lowering or bringing the weight down). Avoid holding your breath while straining to lift a weight. Holding your breath while straining can raise blood pressure to very dangerous levels and is associated with an increased risk for heart attacks, strokes, and even for developing normal-pressure glaucoma.

Optional/Advanced High-Intensity Strength Training Routines
High-intensity strength training requires greater muscular effort and places much more intense physical demands on your muscles. In theory, because you don't allow the fatigued motor units a chance to recover and be used again in the exercise you're currently performing, this type of training ends up recruits muscle fiber (motor units) that are not normally challenged. Caution: These techniques push you to a greater degree of fatigue, and may increase your chances of muscle or tendon injury.

Important points to remember with high-intensity training
- It requires more recovery time after sets.
- Don't use these approaches more than once or twice per week
- Keep high intensity workouts to no longer than 30 minutes and about 10 exercises
- Perform only one or two sets per exercise.

The most effective high-intensity techniques include:
- Breakdown Training
    - Begin with a normal training set. Upon reaching muscle failure the exercise is performed with less weight than the one preceding it. Take off enough weight (10-20%) so that you can do 2-4 (more if you can) additional repetitions. Only rest long enough between sets to change the resistance.
- Pyramid Training
    - Each exercise is performed with slightly less (down pyramid) or more (up pyramid) weight than the one preceding it. Each time you reach a point at which you cannot complete any more reps, remove (10-20%) or add (5%) weight, force more reps, and continue in this manner. Only rest long enough between sets to change resistance. Increases stamina.
- Negative Training
    - Allows for about 30% more muscle force production than concentric contraction
    - Add manual resistance on the lowering phase of any lift
    - Adjust the weight lifted and lowered when using a selectorized plate machine - lighter when lifting and heavier when lowering, or

    - Having your workout partner assist you through a concentric phase (lifting) with an amount of weight you could not lift on your own. Then lower the weight during the eccentric phase without the aid of your partner
    - Delayed onset muscle soreness is very common with this type of training
- Super Slow Training
    - '10-second training'
    - A 10-second concentric lifting phase, followed by a 5-second eccentric lowering phase for each repetition. You can reverse it to get more negative (eccentric) training by lifting in 5 seconds and lowering in 10 seconds
    - Aim at failure within about 4-6 reps
- Super Set Training
    - Most beneficial for developing muscular tone and definition
    - Should not be used for maximal strength gains due to the minimal degree of rest and recovery receive4d between each exercise
    - Two exercises for one body part done consecutively with minimum rest (Beginner: 1-2 minutes; Intermediate: 30-60 seconds; Advanced: < 20 seconds) in between sets. This technique can be applied to opposing muscles, i.e., quadriceps and hamstrings. Working opposing muscle groups in succession
    - This is a common approach to training but allows for the muscle groups to recover while the opposing muscle group is working
    - Compound training, another form of super set training, works the same muscle group back to back, but not necessarily with the same exercise
    - Super setting seems to produce greatest muscular hypertrophy when using a rep scheme of 6-10 repetitions to fatigue

Swiss Ball

Today many trainers, athletes, and bodybuilders use a Swiss ball during resistance training. Advantages of using a Swiss ball include improved balance, improved neuromuscular response and improved "core strength" (core muscles include the abdominal, the lower back and the hip muscles). Strength training on a Swill ball helps strengthen abdominal, hip and lower back muscles, which in turn reduces back pain. It also helps facilitate a better exercise exhaustion of the muscles and wards off unwanted tension on shoulder joints.

Circuit Training

Circuit training does not provide an effective in aerobic workout. Studies evaluating circuit weight training showed an average improvement of only 6% in cardiovascular fitness, as measured by VO2max over a six-week period. Circuit training was described as continuous exercise with moderate weights using 10 to 15 repetitions with 15 to 30 second rest periods.

When to Exercise

Exercising first thing in the morning has two benefits:

1. Greater stimulation of growth hormone secretion. Resistance training causes the spurts of growth hormone that stimulate IGF-1. Training at 70-85% of maximal lift capacity can stimulate a 3-4 fold rapid increase in growth hormone levels for both men and women.
2. Greater thermogenic (calorie-burning) effect. In the morning when you wake up, drink water. Take some carbohydrate fluid (see below). When you finish your workout, eat breakfast, following the guidelines in the Nutrition chapter. If you are exercising primarily for stress reduction, then later in the day after work might better suit your needs. In general, do not exercise within 3 hours before bedtime.

The greatest benefit for the time spent doing weight training comes from working out 3 days a week, no longer than 1-1.5 hours, with each training session at least 48 hours apart. Fewer than two weight-training sessions per week will offer little more than maintenance of your current level of fitness, if any benefit (unless you are a beginner and inactive). Muscles miss the essential recovery time needed for repair and growth if weight training exceeds more than 4 days per week. Alternating weight training days with your aerobic exercise sessions gives a good balance of cardiorespiratory and strength benefits. Incorporate stretching with every workout.

Avoiding Problems

Risks of Exercise

Exercise is not without its risks. Fortunately, they are few and usually minor. There are two main types of injury - minor muscular/skeletal problems, and major heart-related health problems. Minor musculo-skeletal injuries are common, including pulled muscles, torn tendons, slipped intervertebral disks, falls, overuse problems, and so on. Heart problems are mainly a problem for people with significant unknown underlying heart problems who participate in sudden vigorous exercise without a doctor's approval. Have a thorough medical evaluation and participate in supervised exercise programs if you are at added risk. This includes anyone known to have heart disease or multiple risk factors such as diabetes, smoking, or hypertension. All individuals over age 50 should have a thorough medical evaluation prior to initiation of regular exercise programs.

Three additional problems can arise from too much exercise: oxidative stress, muscle accommodation, and overtraining syndrome. Exercising too vigorously - that is, more than 4 hours a week at a maximum rate can produce excessive periods of oxidative stress (free-radical buildup) with subsequent accelerated aging, and destruction of muscle tissue.

Avoid Muscle Accommodation

Vary the specific exercises in your workout routine every 3-4 months, because your muscles will accommodate to the exercise, resulting in diminished benefits. Be sure to work all your major muscle groups. Use your exercise journal to monitor variation in your routine.

Avoid Overtraining
People who are extremely driven are susceptible to overtraining. The underlying causes of overtraining are a combination of emotional and physical factors

- When planning your program, consider the total stress in your life.
- While training intensity (e.g., speed of running or amount of weight lifted) is potentially more stressful than training volume (repetitions, more days, duration of each session), excess in either, or simultaneous increases in intensity and volume may lead to overuse injuries and overtraining
- The most common symptoms of overtraining are feelings of heaviness and the inability to perform well and concentrate
- A way to minimize the risk is to consider following a cyclic (periodization) training procedure. Periodization alternates easy, moderate and harder periods of training over specific periods. As a rule, one or two days of hard training should be followed by an equal number of easy days.
- Allow about 2 weeks to get used to any increase in levels of effort before making the workout any harder or longer
- When increasing the amount of weight you are lifting do not increase by more than about 5-10 percent
- Record how you feel, in your exercise log, during and after your workout

Warm-Up
The goal of a warm-up is just to prepare, not work out, the muscles. Always begin with at least 5 minutes of low-intensity aerobic warm-up, preferably just walking around. Warm up at an intensity that is only 50% of your maximum heart rate (see aerobic exercise section above for calculation of maximum heart rate). This is essential to prepare your body for exercise and to avoid injury. If you have the time at the end of your training session, stretch again for 5 minutes.

Exercise Injury

Acute Injury
The immediate first aid treatment for a pulled muscle or specific pain after exercising is RICE (rest, ice, compression, and elevation). Place ice on the injury every two hours for about 10 to 15 minutes, over a 48-hour period. If injury doesn't respond to RICE in a couple of days, you should see a medical professional.

Overuse Injuries
Overuse injuries encompass a broad range of exercise related injuries. These type injuries are caused by overtraining over a long period of time gradually weakening or irritating an area of the body until exercise becomes difficult or impossible, or other symptoms appear.

Most overuse injuries can be avoided by utilizing proper form and technique, appropriate rest, proper equipment and clothing (especially footwear), and a conservative increase of exercise frequency, intensity, or duration.

Chondromalacia and Patellofemoral Syndrome
Patellofemoral syndrome "parenthesis runner's knee) is generalized knee pain. Generally caused by improper running form over a period of time and may or may not be due to a pathological condition of chondromalacia. Chondromalacia is the wearing away of the cartilage on the back surface of the kneecap, manifested as a "clicking" or "grading" sound, and knee pain under the patella.

Plantar Fasciitis and Neuromas
Plantar fasciitis is literally an inflammation of the plantar fascia, a web of tough, fibrous connective tissue on the bottom of the foot. Neuromas are irritated nerve endings, but can cause pain in the foot (or other places, depending on the nerve in question). Either condition could be caused by poor technique or simple overuse but should be examined by a physician to determine the cause. If the problem is orthopedic in nature, orthotic shoe inserts may be prescribed by a medical professional to alleviate future problems.

Tendonitis, Arthritis, Bursitis
Tendonitis (inflammation of a tendon) and bursitis (inflammation of the fluid filled cushioning sex between tendons and bones) are common overuse injuries. Rehabilitation requires rest in the attention of a physician. Osteoarthritis is caused by worn joint cartilage thereby exposing the joint surfaces, with swelling and edema. Rheumatoid arthritis is an autoimmune disorder in which the body's immune system attacks joint tissues.

Shin Splints and Compartment Syndromes
Shin splints are a common name for pain felt in the anterior portion of the lower leg and can be caused by a muscle imbalance. Shin splints require rest, ice, compression and elevation and strengthening exercises to prevent future occurrences. Pain can also be caused by a more serious condition known as a compartment syndrome where one of the compartments between the muscles becomes inflamed and swollen, which stresses the blood vessels and nerves in the area. This situation requires immediate medical attention.

Breathing Reactions
Exercise reactions range from red blocking us on the neck, face, or arms, to exercise induced asthma or bronchospasm, or even anaphylaxis. Exercise induced anaphylaxis is a severe allergic reaction requiring immediate medical attention.

Exercise induced asthma may be triggered by exercising in cold, dusty, or excessively humid environments, and can range in severity from mild coughing to severe discomfort. Individuals who suspect that they have exercise induced asthma are encouraged to seek medical attention.

General recommendations for persons with exercise induced asthma include an extended warm-up, avoidance of cold, dusty, or extremely humid environments for exercise.

Hyperventilation is the process of repeated quick and shallow breaths utilizing the top of the chest. This sharply reduces the level of carbon dioxide in the blood, which causes the arteries of the blood to constrict thereby reducing the flow of blood throughout the body. Lack of blood flow and subsequently oxygen trigger the sympathetic nervous system. This may cause anxiety and irritability. Hyperventilation can be caused by anxiety, extensive physical injuries or even heart or lung disease. Initial management involves covering the nose and mouth with a small paper bag, breathing slowly and re-breathing in the bag are about 10 times. Then breathe normally for a few minutes, about one breath every five seconds. Repeat these steps if symptoms persist.

Environmental Concerns

In hot weather were like clothing that breathes well, and allows for the evaporation of sweat. "Sauna suits," "Tommy Raps," and other products designed to encourage quick weight loss through sweat are particularly dangerous. The body can reach dangerous or even fatal core temperatures in very short period of time. And the weight loss is simply water and will be regained as soon as water is ingested again.

Exercise at a reduced intensity during high humidity. The body is cool by blood circulation in the evaporation of sweat. In high humidity, evaporation becomes less effective at cooling and the risk of heat related injury is greater.

Adequate hydration is also key to safe exercise and heat, as the body will produce large quantities of sweat. In just one to 2 cups of water before exercise and 4 ounces every 10 to 15 minutes during exercise. Thirst lags behind the bodies need for fluid. By the time thirst is felt dehydration has occurred. Minor dehydration can affect performance, and severe dehydration can be life threatening.
Contrary to popular belief, water consumed during exercise will not contribute to cramping, so "swish and spit" should be avoided in favor of consuming small amounts of water steadily during exercise session. Dehydration can actually contribute to cramping.

In the cold, dress in layers that will wick sweat away from the body. Remove outer layers as the body warms and replace during the cooldown to avoid an excessive chill.

Heat Related Injuries

Heat cramps are the least severe in first sign of an impending heat problem and is manifested by painful muscle spasms usually in the legs and abdomen. It is important to rest in a cool place consume cool water or a commercial sports drink. Lightly stretch and gently massage the area. Do not take salt tablets or salt water. This can make the situation worse.

Heat exhaustion is more severe with symptoms of cool, moist, pale or flushed skin, headache, nausea, dizziness, weakness, and exhaustion.

Heatstroke is the most severe heat emergency. The body systems are overwhelmed by heat and began to stop functioning. Heatstroke is a serious medical emergency that is

manifested by red, hot, dry skin, loss of consciousness, a rapid, weak pulse, and rapid, shallow breathing.

Victims of heat exhaustion and heat stroke should be moved out of the heat. Loosen any tight clothing and apply cool, wet cloths. If the victim is conscious, give cool water to drink. Do not allow the victim to drink too quickly. Give about one glass of water every 15 minutes. Like the victim rest in a comfortable position and watch carefully for changes in their condition. The victim should not resume normal activities the same day. Medical attention should be sought.

Hypothermia and Frostbite

Frostbite is the freezing of tissue. The skin becomes yellowish, and will be cool to the touch. Provide first aid by warming the affected area using warm water. Do not rub the area, as this can cause further tissue damage. A medical professional is required to assess the extent of the damage.

Hypothermia is a life-threatening condition wherein the core body temperature has become dangerously low. Many of the same symptoms as heat exhaustion, including dizziness, nausea, loss of appetite, vision problems, etc., may be present. In the case of hypothermia it is important to call 911 immediately, and use any means present to warm the victim, such as removing wet clothing or putting them in a sleeping bag with an uninfected person who can provide body warmth until help arrives.

Eating Before and After Exercise

Two decades of research have shown that consuming carbs after a hard workout rebuilds worn muscles and primes the body for the next training. Failure to eat the right food after exercise — or worse — skipping the post-exercise meal altogether can harm your body.

Carbs — the main source of energy during physical activity — are stored as glycogen in muscle cells. During exercise, the glycogen reserves deplete and an intake of carbs is needed to replenish the body. Neglecting or avoiding the post-workout meal could result in muscle breakdown and leave your body feeling fatigued during the next workout. Keep in mind, however, that sugar is absorbed into the bloodstream within minutes and consuming large amounts of sugar prior to exercise can actually inhibit performance. This produces a drastic increase in blood sugar, stimulating the pancreas to secrete large amounts of insulin to metabolize the sugar. All this insulin inhibits the metabolism of fat by the muscles during exercise. Therefore, the muscles are forced to rely more on glycogen, which is in limited supply. The insulin reduces blood sugar level, which is already being reduced by the muscle utilization of glycogen stores for energy production. The blood sugar level reduces to a level, which may not only cause fatigue, but dizziness as well.

How much carbs should be eaten after exercise depends on the duration and intensity of the workout, as well as when the next training will occur. For example, a post-workout meal is generally more essential for a triathlete who runs in the morning and

cycles in the afternoon than a marathoner who just runs one race. That's because the triathlete needs to refuel in between workouts while the marathoner has more time between runs to recover.

Experts recommend that carbs be eaten 30 minutes after vigorous exercise since that's when the body will act like a sponge and absorb the nutrients. The general guideline is a carb intake of 0.3-0.5 grams per pound of body weight. So a 150-pound person should eat about 75 grams of carbs. However, unless you have had a very long intense workout, 0.5 grams may be a bit excessive as excess carbohydrate can be converted to body fat. Many body builders use a 50/50 combination of Maltodextrin and glucose post exercise, to optimize glycogen replenishment.

The guidelines for quantity before exercise are not as clear as after, but carbohydrates and protein are part of the equation so you might want to experiment with that too.

Recent research has shown that combining protein with carbohydrate in the two-hours after exercise nearly doubles the insulin response, which results in more stored glycogen. Furthermore, adding protein can also help the body recoup. After exercise, the body decreases its rate of protein synthesis and increases its rate of protein breakdown. However, the provision of protein has been shown to reverse this trend, increasing protein synthesis and decreasing protein breakdown. Protein helps repair and rebuild skeletal muscle fibers damaged during hard training, but eating too much protein after exercise is not good either because it can slow rehydration and glycogen replenishment. A 2:1 to 4:1 ratio of carbohydrate to protein is optimal for recovery. A liquid protein, such as a protein shake, may provide faster absorption.

The consumption of essential fats is one of the most overlooked areas of daily nutritional intake but during the post workout period, eating fat can actually decrease the effectiveness of your post-workout beverage. Since fat slows down transit through the stomach, eating fat during the post workout period may slow the digestion and absorption of carbohydrates and proteins. As your post workout feeding should be designed to promote the most rapid delivery of carbohydrates and protein to your depleted muscles, fats should be avoided during this time.

Water is vital for many chemical reactions related to exercise, including the breakdown of ATP for energy. Fluid lost from sweating and increased respiration during exercise can affect these cellular processes. It also causes decreased and thicker blood volume. The result is a lower stroke volume (amount of blood pumped by the heart per beat); lower cardiac output (amount of blood pumped by the heart per minute) and a decreased oxygen delivery. Performance starts to decline with as little as 2-3 percent decreases in body weight due to fluid loss.
Drink 1 cup of water 30 minutes before exercise, and ½-1 cup every 15 minutes during exercise. If your workout is low to moderate intensity and lasts less than an hour, plain water is effective. However, the best rehydration fluids are those that contain sodium, which stimulates your kidneys to retain water. Here are situations where you might need more than plain water:

- Exercising in very hot or humid conditions
- Exercising continuously for more than 45 minutes
- When you are losing a great deal of electrolytes through sweat (e.g., long duration, very intense exercise, high heat/humidity) you are at risk for hyponatremia (low blood sodium) if you consume only water and no electrolytes
- Sports drinks, such as Gatorade and PowerAde, replace fluids, electrolytes, and carbohydrates are preferable over water in these situations

Caffeine increases the mobilization of free fatty acids in the blood, which are used for prolonged energy requirements as in marathon running. However, caffeine is a central nervous system and cardiovascular stimulant, thereby increasing the basal metabolic rate, heart rate and blood pressure. Rapid heart rate can develop leading to an unusually high heart rate during exercise. However, after approximately 45 minutes from caffeine ingestion, bradycardia occurs, or a slowing of the heart rate and lasts for up to an hour thereby decreasing cardiac output. Bradycardia leads to fatigue and an inability to exercise. Caffeine is a diuretic and therefore may promote dehydration due to increased urination.

Personal Trainer

You want your resistance training to be effective. To assist you in achieving your exercise goals, consult with a qualified trainer before you begin any type of resistance training. At the very least, consider hiring a personal trainer for the first few sessions and then again every 2-4 months. Many personal trainers will come to your home or workplace. Using a trainer can provide a big payoff for the investment.

A good trainer will focus closely on technique, so you will learn how to do each exercise properly. Go several times in the first two weeks to reinforce what you learn. After the first two weeks, go for a refresher session once a week for a month and then go once a month after that or as needed.

Staying Motivated

- Train for an event. Committing to an event can jumpstart your workout program. And the feeling of accomplishment you get from completing your event is like nothing else. If you're a novice, an excellent option is to join a training program organized by a charity.
- Keep your goals in plain sight. Some people tape their goals to the bathroom mirror or refrigerator, or place them in their exercise logbook. The important thing is to glance at them on a daily basis.
- Work out with a club or a team. Whether you join a bike club, a hiking group, or a swim team you're sure to gain inspiration from your workout buddies.
- Work out with a friend.
- Join an internet fitness community. Several fitness Web sites have forums where visitors can chat with like-minded exercisers and develop strong bonds with one another. Internet groups are especially helpful for home exercisers.
- Test your fitness regularly. Track your progress in an exercise logbook or journal.

- Mix up your workouts. Some people thrive on routine. Most of us, however, need a bit of variety to stay motivated. You might want to try cross-training, which simply means mixing up your activities.
- Dress the part. New workout clothes can get you fired up to work out.
- Read success stories. I'm not talking about those before-and-after weight-loss ads. I'm referring to legitimate accounts of fitness success chronicled in magazines and on fitness Web sites. The good ones offer not only inspiration but specific and realistic advice. You can find success stories in magazines such as Fitness, Men's Fitness, and Good Housekeeping.

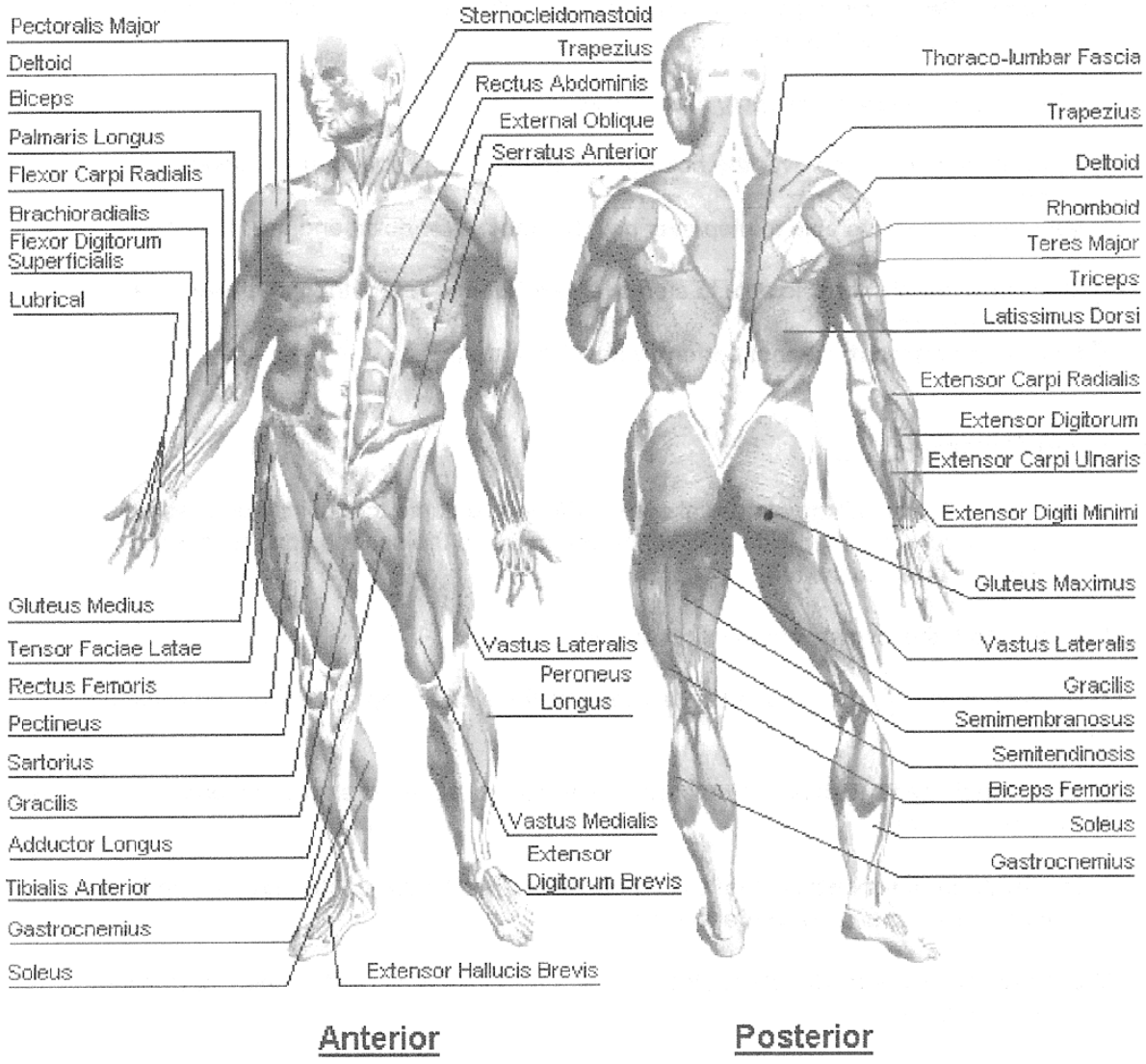
Effectiveness of Stick-to-it Exercise Strategies

The following table lists strategies to encourage ongoing exercise, along with the percent of successful exercisers who rated each strategy as one of the three most effective at helping them stick to a regular plan:

Pick the same time of day	56%
Exercise near home or work	48%
Exercise outdoors	42%
Join a health club	32%
Exercise with friends or family	24%
Weigh yourself	20%
Watch TV during workout	15%
Walk the dog	11%
Listen to music during workout	11%

Consumer Reports, January, 2005

Muscle Anatomy Chart



Source: International Fitness Association

NOTES

Optimal Hormone Balance for Living Younger

"We have it in our power to begin the world over again" – Thomas Paine

"We age because our hormones decline. Our hormones do not decline because we age." This is the mantra for the Neuroendocrine theory of aging. Hormones are chemical substances in our bodies that are released to have an effect on tissues somewhere else in the body. They act as biochemical messengers. They turn on cell functions and turn off cell functions. Gene expression can be altered by the presence or absence of hormones. Hormones control our responses to illness by controlling our immune system, our responses to stress, our sexual development, our growth and our metabolism. When hormone levels are balanced and at optimal levels in our bodies, we are more likely to enjoy good health provided our lifestyle choices are also healthful.

Whereas nerves are a hardwired means of communication throughout the body, it helps to visualize hormones as the biological equivalent of a wireless communication system, only more complex. A central 'server' – the hypothalamus – is the key to maintaining the balance of hormonal communication flow. Most hormones convey their information by traveling through the bloodstream. The biological messages carried by hormones are specific and not intended for every cell in the body. At the same time, some hormones act on multiple cell types. Three types of hormonal systems (endocrine, autocrine, and paracrine) constitute your biological communication system. All three systems working together can effectively prevent accelerated aging. Any miscommunication is like a weak link in a chain that leads to hormonal chaos and possibly accelerated aging.

Frequently, sets of hormones have opposite physiological functions, so that their constant interaction will keep a particular biological function within a desired range. When sets of hormones work like this, they act like 'yin and yang.'

Optimal hormonal levels occur for most people during their twenties and thirties, and may continue for another 15-20 years with a subtle decline. During this same span of time, fewer diseases arise than during almost any other time of life. Cancers are less likely, occurring more frequently in younger and older ages, as a rule. Diabetes is more likely to show up in younger and older individuals. Heart disease, bone fractures, infections, and so on, seems to predominate before and after these years. This lends to the feelings of invincibility most of us feel during our twenties and thirties. Beginning in our late thirties, hormone levels begin a steady decline. We do not usually notice the effects until about our early forties or occasionally, late forties and early fifties. As the hormonal communication system declines, you begin to age more rapidly. Your biological age is intimately tied to the health of your endocrine system. Any decline in your hormone system has negative consequences on your longevity by increasing your likelihood of death.

Unlike the predictable decline experienced with most hormones, insulin and cortisol levels increase with age. Hyperinsulinemia may be among the worst aging nightmares.

Corticosteroids are hormones manufactured in the adrenal glands and are critical to your body's response and management of stress. One potential definition of aging is the deterioration of the body's ability to respond to stress. Large amounts of cortisol are released in response to stress. While this is an essential function for survival, when stress is prolonged it can damage the feedback loop that regulates cortisol levels. Prolonged and uncontrolled cortisol secretion exhausts the body. It can inhibit the immune system, slow protein synthesis, and lead to neuronal loss, brain damage, bone loss, muscle wasting, increased abdominal fat, psychosis, premature aging, and death.

Cortisol, insulin, melatonin, progesterone, estrogen, testosterone, and growth hormone are among the hundreds of known hormones that must play like the keys of a grand piano in response to environmental sheet music. Prolonged cortisol secretion drives down the levels of many other hormones. With fewer hormones in place to regulate and mandate order, ever-increasing cellular and system disorders arise.

Hormone declines determine the biological markers that change as you age. Hormone changes, then, may be thought of as secondary markers of aging. Therefore, a significant step toward controlling aging lies in the ability to replenish and adjust hormones. The right balance of hormones helps manage and maybe even slow the aging process; the wrong balance will certainly accelerate it. The goal is to replenish hormone levels equivalent to those found in a healthy 25-30 year old individual. The reason becomes more apparent by answering the following questions: When do most cancers occur? When do most bone fractures occur? When do most serious infections occur? When do most medical problems occur? The answer is that they occur more often in the very young and in the old. Mostly, we are at our peak health from our mid-twenties to our late thirties. However, it's not always just the lack of certain hormones that is the fundamental cause of aging, but how hormones lose their ability to communicate with each other to maintain balance. Fortunately, bioidentical hormone replenishment therapy, when clinically indicated, can potentially improve a person's physical and mental status to that of a person 10-20 years younger; provided one also makes healthful nutrition choices, exercises appropriately, effectively manages responses to stress, balanced with emotional and spiritual health.

The Priorities of Hormone Balance

Hormone balance and optimization does not result simply by taking a prescription for hormones. The greatest benefit only comes about by taking three steps, particularly in the following sequence. The first order of priority for optimizing your hormones is to balance hormones that contribute to inflammation, pain, excessive blood clotting, cancer, and so on. These hormones are called eicosanoids, of which there are likely hundreds. You may be familiar with a class known as prostaglandins, or the leukotrienes, for example. How is the first order of priority addressed? With good nutrition, exercise, stress management and maintaining a healthy body composition. We discussed the key principles of a nutritional lifestyle for creating hormone balance in

the nutrition chapter. Unless this priority is sufficiently addressed first, the next two orders of priority will prove less effective. This point cannot be emphasized too strongly.

The next order of priority is to enhance your own natural production and secretion of hormones, and improve the sensitivity of their cellular hormone receptors. This step also combines a balanced nutritional lifestyle with a program of regular exercise, stress management, with targeted nutritional supplementation. It is possible to significantly boost declining levels of critical hormones, such as testosterone and growth hormone, while reducing harmful increases in hormones like cortisol and insulin. Metabolic pathways and enzyme actions affecting hormone levels can be inhibited, resulting in hormone level changes. For example, testosterone can be converted to estradiol by an enzyme process known as aromatization. This can be troublesome for men as too much estrogen may be a contributing factor in the development of prostate disorders and increases the risk for heart disease in men. Unfortunately, testosterone aromatizes to estradiol more readily with age, excess body fat, zinc deficiency, too much alcohol consumption, and so on. In this example, the second order of priority begins with efforts to minimize aromatization of testosterone to estradiol: a hormonally balanced nutritional lifestyle and exercise to lose excess body fat, increased dietary zinc, and reduction of alcohol consumption. Additionally, supplemental zinc, large doses of vitamin C, and a plant-based nutritional supplement know as chrysin may further interfere with aromatization of testosterone to estradiol. Furthermore, the second order of priority strives to improve the body's natural production of testosterone with a program of weight training. In some instances, first and second levels of intervention alone result in adequate hormonal balance, without the need to move to the third order of priority – hormone replacement therapy.

When intervention at the first two levels fails to optimize hormones fully, the final order of priority calls for prescribing hormone replacement. The goal of prescription hormone replacement therapy is to achieve hormone balance at youthful but safe levels for as long as possible.

Biologically Identical Hormone Replenishment Therapy

Biologically identical hormones, often referred to as bio-identical, or 'natural' hormones, are identical in molecular structure to the hormones the body makes. When a bio-identical hormone circulates through your system and binds with a receptor, the fit is the same as if your body had produced that hormone. Synthetic hormones may be foreign to the body and are often treated by the body as toxins. They may not have the same molecular structure as human hormones. When one of these binds with its receptor, the fit is not exact, sometimes resulting in side effects.

Biologically identical hormones generally provide advantages over synthetic hormones when metabolized. Metabolism is performed by enzymes whose work is to break down (metabolize) hormones – the enzymes won't metabolize hormones they don't recognize, which can cause non-bio-identical hormones to sit on the hormone receptors longer than they should, which in turn can cause over-stimulation of the receptors and possible side effects. Additionally, to be effective hormones need to communicate with other

hormones. Synthetics don't always do this effectively or correctly. The goal is to improve cellular communication, restore balance and optimize function. The optimal approach replenishes all suboptimal and deficient hormones at one time.

Why replenish multiple hormones, rather than one at a time? The answer is very simple. We are not one-hormone creatures. Hormones do not work in isolation from one another; they work in harmony, like individual instruments in a symphony. Hormones have synergistic and overlapping effects in the body. By improving the system with one, you may need less of another to make further improvements. In addition, chances of side effects are reduced when you replace less of each hormone. No matter how many hormones you replace, patience and getting in touch with your body's responses to hormone replacement are the keys to success.

The third level of priority, bioidentical hormone replenishment therapy, should avoid use of unnecessary hormones and unnecessarily high doses of hormones. Optimal results, then, depend on implementing the first two orders of priority before hormone replenishment. To reiterate, this begins with a hormonally balanced nutritional lifestyle. Hormone production and balance depends on the foods we eat. The next step is the integration of regular exercise into your life. Exercise by itself can boost natural hormone production, improve hormone receptor sensitivity, and improve hormonal communication. Appropriate and judicious use of targeted nutritional supplements can further improve hormonal balance. The final step before starting a hormone replacement program is to manage cortisol levels through effective stress-response management. Chronic elevated levels of the stress hormone cortisol negatively impact the blood levels of a variety of other hormones, such as DHEA, testosterone, growth hormone, thyroid, and so on. The efficacy of the hormones you ultimately decide to replenish will be improved markedly in this manner. Moreover, you will find it much easier to sustain and manage optimum hormone levels.

Finally, hormone replacement requires careful monitoring with periodic blood tests to assure you are achieving safe and effective levels. Hormone replacement therapy is never indicated unless sufficient clinical evidence supports it. Physical signs and symptoms are a starting point, but blood testing provides an objective means of knowing when and what doses of hormones are required and safe. An initial laboratory panel is required prior to initiating hormone replacement. Generally, a few months after therapy has been initiated your doctor will measure the levels again. Everyone responds differently to hormone replacement therapy so, be patient; it may take several dosage modifications to reach optimum response. As long as you continue to use hormone replacement therapy, you will need periodic blood testing and evaluation by your physician, as your body changes over time necessitating occasional dosage adjustments.

DHEA

DHEA (Dehydroepiandrosterone) is a steroid hormone produced from pregnenolone in the adrenal cortex, gonads, nervous system and brain. About 90% is produced in the adrenal glands. It is one of the most abundant hormones in the body and is a precursor to testosterone, estrogen and progesterone. DHEA has weak androgenic activity. Other reported actions include anti-inflammatory, anti-cancer, anti-obesity, anti-diabetogenic and anti-aging.

DHEA levels decrease progressively from a peak at age 25 to less than 20% of that peak before the age of 70. Many people over the age of 40 produce inadequate levels of DHEA. Levels are typically low in those with chronic diseases such as obesity, diabetes, immune deficiencies, cancer, high blood pressure, heart disease and AIDS. Elevated insulin levels decrease DHEA levels; one reason why hyperinsulinemia increases vascular disease.

Low DHEA levels may be result from menopause or andropause, decreased DHEA production, excess alcohol consumption, birth control pills, hypothyroidism, lack of exercise, obesity, aging, and smoking. DHEA is controlled by the adrenocorticotropic hormone (ACTH), explaining why DHEA levels show variations parallel with cortisol and ACTH pulses. Cortisol is the primary stress hormone. Increasing levels of cortisol send a negative feedback to the adrenal glands resulting in diminished DHEA production. Stress not only reduces DHEA production, but at the same time increases DHEA consumption. Managing stress reduces the stress hormone cortisol, resulting in improved levels of DHEA. Meditation, for example, can be a powerful tool for stress management. Some studies also suggest that replenishing DHEA levels to youthful levels will reduce the production of corticosterone and cortisol, the stress hormone. In fact, this may be the best reason to take DHEA as part of a preventive-aging program.

DHEA has the following potential effects:

- Improved energy levels
- Lowers LDL cholesterol levels (one study, however, has shown DHEA replacement may reduce HDL cholesterol levels in females)
- Lowers insulin levels, helping to stabilize blood sugar levels
- Enhances immune system response by stimulating the thymus gland and by affecting the PPAR receptor lymphocytes, which decrease the production of free radicals by monocytes, resulting in a possible decreased risk of infections, malignant tumors or cancers
- Plays a role in conversion of fat to lean muscle
- Reduces platelet aggregation
- Modest decrease in cardiac risk for men
- It binds to GABA and NMDA receptors, creating a positive impact upon depression, memory and cognition, by opening calcium channels.
- Assists in improving symptoms associated with some learning disabilities, obesity and autoimmune diseases such as chronic fatigue syndrome, arthritis, lupus, Epstein-Barr, and adrenal insufficiency

- May play a role in treating or preventing osteoporosis
- An estrogen-like effect on the brain, by increasing beta-endorphin levels after initial therapy
- DHEA exerts its effects upon the central nervous system by binding to the GABA receptor
- In some animal studies DHEA has slowed the aging process

DHEA Replacement
The goal is to return the DHEA-Sulfate level to that of a 25-35 year old. DHEA naturally peaks between 6 AM and 1 PM. The optimal time of administration is in the morning and/or midday. Use pharmaceutical grade DHEA. DHEA is fat-soluble and is better absorbed with a meal, preferably one that includes some healthy fat. DHEA may cause difficulty falling asleep if taken at dinnertime or later.

Cautions with DHEA Replacement
Prevailing wisdom advises cautious use of DHEA in men with existing prostate disease, theorizing that it may increase testosterone levels. The preponderance of the current evidence does not support this. If a male has a normal PSA level and a normal digital rectal exam, the use of DHEA may potentially be of benefit in preventing prostate cancer. 7-keto-DHEA may be a better choice for men, as it will not metabolize to estrogen. Transdermal DHEA cream is also less likely to convert to excess estrogen in men.

DHEA supplementation in female patients can sometimes raise testosterone levels and DHEA may raise estrogen levels enough so that estrogen replacement therapy may not be needed. Women with breast cancer should consult with a physician before taking DHEA. Women taking DHEA should also be taking melatonin, Vitamin E, Indole-3-Carbinol (or DIM), plenty of soy and vitamin D to improve breast protection.

Side Effects
Side effects are generally dose related, and blood levels should be monitored. When side effects occur, discontinue replacement for 1-2 weeks, then resume at one-half the previous dose. Women on very low fat diets may have less tolerance for DHEA.

Side effects of excess DHEA are generally dose-related, and can include
- Acne or oily skin, hirsutism, hair loss and decreased HDL cholesterol have been reported in women
- Male pattern baldness
- Deepening of the voice
- Fatigue
- Mood changes, anger, depression, irritability
- Weight gain
- Sugar cravings
- Insomnia and restless sleep
- Increased IGF-1 levels

Melatonin

Melatonin is produced naturally in the body, by the pineal gland in the brain. It is a fundamental regulator of the body's inner clock, or circadian rhythm, which determines the 24-hour sleep/wake cycle. Levels are higher at night, are suppressed by bright light, and decline as we age. The length and height of the melatonin peak at nighttime determines the circadian phase of the biological clock and governs vital body parameters such as the variation of hormone levels, body temperature and sleep-wake cycles. Hormones such as estrogens, testosterone, DHEA, growth hormone, and cortisol are subject to circadian fluctuations. Over 100 body functions fluctuate over a 24-hour period and are dependent on sunlight and darkness as cues.

Melatonin derives from the essential amino acid L-tryptophan. Tryptophan, consumed in foods we eat (especially turkey and milk), is converted into the neurotransmitter serotonin, and is then further metabolized into melatonin at night. Melatonin levels are higher at night because bright light suppresses melatonin production.

The pineal gland is important, for not only producing melatonin but it also helps in restoring the thymus gland. The thymus gland, located in the upper chest, is a player in immune function by producing T-cells and natural killer cells. Unfortunately, the thymus begins to shrink drastically after about the age of 12. Because of the pineal gland's direct effect on the thymus gland, replenishing adequate melatonin levels may improve immunity.

As we age, melatonin levels decrease. That is one reason why older people sleep less, even though they need the same amount of sleep as they did when they were younger adults. By about the age of 45 the pineal gland runs down. While melatonin secretion slowly declines over many years, in middle age the hormone level plummets.

Melatonin has a broad range of other effects on the body. It works with cholecystokinin (CCK) in the digestive tract to decrease the incidence and severity of many symptoms associated with colitis and gastric ulcers. Melatonin may also help fight against cancer, especially cancer of the prostate, breast and colon. Studies suggest that women who work night shifts may have up to a 60% greater risk of developing breast cancer, presumably due to lower melatonin production. Furthermore, the risk increases 14% for each night per week that a woman works between 1 and 2 AM. As a result of the protective effect melatonin has on cells, it may also make chemotherapy more effective.

Melatonin has a neuro-protective effect on the brain. Several well-conducted animal studies show administration of melatonin after a stroke may help keep brain damage to a minimum. Another process that may explain the protective benefit of melatonin is that it is a powerful antioxidant, especially in the brain. It is the most abundant antioxidant in the brain, an important fact because many antioxidants are unable to cross the blood-brain barrier into the brain. Melatonin also enhances the activity of one of the body's most powerful natural antioxidants, glutathione. Protecting your brain from oxidative stress is crucial for optimum aging.

Melatonin supports age-related T3-decrease. Melatonin also has important effects on the menstrual cycle. Melatonin secretion increases with administration of estradiol in postmenopausal women.
Melatonin is known to interact with the immune system and inhibits platelet aggregation. Although most migraine headaches are symptoms of some form of autoimmune disorder, limited studies show that cluster migraine headaches may be a response to a pineal circadian irregularity, and the administration of melatonin normalizes this circadian rhythm. That is, melatonin may play a role in re-synchronizing biological rhythms to lifestyle, and may subsequently prevent migraines.

Impaired melatonin secretion is found in coronary heart disease. Melatonin may help nocturnal labile hypertension. It also inactivates norepinephrine.

We cannot live without cortisol, but we cannot live long healthy lives with prolonged elevated levels of cortisol either. We need cortisol for life-threatening situations, but in today's world, even meeting deadlines have replaced basic survival as a stimulus for elevated cortisol levels. Perhaps one of the reasons that cortisol levels increase with age is because cortisol production is regulated, in part, by melatonin levels. Maintaining melatonin levels equivalent to those of a 25-35 year-old may prevent damage caused by long-term elevated levels of cortisol.

For years, melatonin has been popular to treat jet lag and insomnia. By replenishing melatonin with a supplement, the sleep/wake cycle can be adjusted to allow quality rest at night and optimal function during the day.

Natural production of melatonin may be diminished by any of the following:

- Caffeine
- Alcohol
- Nicotine
- Vitamin B12 supplementation in quantities greater than 3 grams
- NSAID anti-inflammatory medication
- Beta-blocker medication
- Glucocorticoid medication
- Anti-depressant medication
- Chronic stress

Address these matters, when possible, prior to or concurrent with melatonin replacement

Melatonin Replacement
Daily melatonin replacement therapy is advised beginning around age 40 and older. Melatonin supplements derived from animals should be avoided. Melatonin is administered within 1 hour of bedtime. Even a minimal dose (e.g., 0.3 mg) will provide an adequate antioxidant effect. If the treatment goal includes better sleep, the dose may be increased weekly in 1-3 mg increments, up to the limit recommended by your physician.

Some patients will experience a diminishing sleep effect with melatonin over time, even after increasing the dose. The problem can usually be resolved by discontinuing use of the melatonin for 1-2 weeks. Because melatonin is a natural substance and is not addictive or habit forming, there is no rebound effect from discontinuation. Unless you consistently use pharmaceutical grade melatonin, the actual concentration of melatonin may vary significantly from brand to brand.

Cautions with Melatonin

- There are no contraindications to melatonin replacement therapy.
- Asthmatic patients with nighttime exacerbation of their asthma should exercise caution with melatonin supplementation
- Some doctors believe that patients with leukemia, Hodgkin's disease, or lymphoma should avoid melatonin until more is known about its effects on these forms of cancer
- Use melatonin cautiously if you have an autoimmune diseases, such as rheumatoid arthritis
- Avoid driving or using heavy machinery when melatonin is in your system, as it generally causes drowsiness

Side Effects with Melatonin

- Side effects from melatonin are rare and are related to high doses
- The most frequent side effect occurs from taking a dose higher than needed, resulting in morning grogginess. When this happens, reduce subsequent doses
- Stomach discomfort
- Vivid dreams or nightmares may occur
- Headaches
- Suppression of male sex drive

Pregnenolone

Pregnenolone is a hormone produced in the mitochondria in the brain, gonads and the adrenal glands. It is derived from cholesterol, is a precursor for the biosynthesis of steroid hormones. Pregnenolone has been called the mother of hormones because it is the precursor hormone to cortisol, progesterone and to DHEA, which is a precursor to the sex hormones testosterone and estrogen. Pregnenolone can be found in greater concentrations in the brain than in any other organ in the body and serves to enhance all our mental functions. As we age pregnenolone levels decline in the body as much as 60% by the time we are 75 years old.

On its own pregnenolone is essential to keeping brain function at its peak capacity. However, male and female bodies use pregnenolone differently. In women, more of the pregnenolone becomes estrogen while in men more is used to make testosterone. For this reason, men with prostate conditions should use pregnenolone with caution. Pregnenolone replacement can raise progesterone levels in women as well.

Memory enhancement has been observed in humans and animals when given pregnenolone. Pregnenolone reinforces neurotransmitter systems that decline with age. It stimulates release of acetylcholine in the hippocampus of the brain, facilitating memory processes. It may also be an important component in repairing the fatty layer that protects nerves, known as the myelin sheath. Pregnenolone may also have a protective action against the unwanted effects of elevated levels of cortisol, our stress hormone. There as yet unsubstantiated claims that pregnenolone is useful in some forms of cancer and arthritis, in degenerative diseases associated with aging in general and in obesity. Current research is being done to test pregnenolone's ability to help those suffering from Alzheimer's disease, multiple sclerosis, cardiovascular problems and for boosting the immune system.

Cautions with Pregnenolone Replacement
Because pregnenolone is a precursor hormone to estrogen and testosterone, those with prostate, breast and uterine cancer should avoid pregnenolone replacement

Pregnenolone Replacement
Pregnenolone is best taken in the morning on an empty stomach.

Side Effects
There are no reported major adverse effects from the supplementation of pregnenolone. Minor side effects have an incidence of less than 1% and include

- Headache
- Bloating and nausea
- Menstrual irregularities
- Heartburn
- Acne
- Sense of agitation
- Sedation

- There have been no reported significant effects on the hormones that are derived from pregnenolone, even in high doses. Nevertheless, conversion to DHEA could theoretically cause acne and hair loss, especially in women

If any of these symptoms occur, discontinue the pregnenolone for one week or until symptoms resolve and notify your physician, then resume at one-half the previous dose.

Thyroid

The thyroid gland is located in the neck, below the larynx, known as the voice box. The thyroid gland affects every function in the body because it controls metabolism. Thyroid hormones regulate the entry of oxygen into the cells, thus controlling metabolic rate, body temperature, brain maturation in neonates, heart rate, hair growth, ovulation, skin turnover, growth and development. Additionally, thyroid increases protein synthesis.

Thyroid stimulating hormone (TSH) is produced by the pituitary gland in the brain and stimulates the thyroid gland to produce T4 (thyroxine). T4 is the primary hormone secreted from the thyroid gland. The liver and other tissues convert most of it to T3 (triiodthyronine), the more active form. T4 crosses the blood-brain barrier, but T3 does not. Some T4 also converts to metabolically inactive Reverse T3, more so with age.

Having thyroid levels in a youthful range is critical for good health:

- CRP, a marker for inflammation, increases with low thyroid function
- Elderly people with abnormally high thyrotropin have a longer life span without adverse effects. Increasing levels are associated with a lower mortality rate (JAMA. 2004:292-2591-2599)
- "Women with a diagnosis of primary, symptomatic hypothyroidism who are on thyroid supplements are less likely to be diagnosed with invasive breast [cancer]." Cancer. 3-15-05. Massimo Cristofanilli, MD. University of Texas M.D. Anderson Cancer Center

Thyroid hormones play a crucial role in normal cardiovascular function. Thyroid hormones have the following effects on the heart:

- Directly affects the heart and peripheral vascular system
- Increases myocardial inotropy and heart rate
- Changes in cardiac function are mediated by T3 regulation of cardiac-specific genes
- T3 reduces systemic vascular resistance
- Dilate peripheral arteries to increase cardiac output

Smoking, a toxic environment, stress, chronic antibiotic therapy, congenital defects, genetic disorders, infection, nutritional disorders, radiation, hormonal imbalances (e.g., HGH) and tumors can all affect thyroid function.

Hyperthyroidism

When thyroid levels are too high, it is called hyperthyroidism. TSH levels are generally low. Thyroid hormone excess, especially T3, can produce anxiety, fatigue, cardiac arrhythmias, heart palpitations, high blood pressure, weight loss, heat intolerance, diarrhea, sweating, rapid bone growth, specifically around the eyes, and protruding eyes.

Hypothyroidism
The condition known as hypothyroidism is more widespread in women and the elderly. With age, thyroid levels decrease, conversion of T4 to T3 diminishes, and thyroid receptor sights become more resistant. It has been estimated that 15-40% of the population suffers from an underactive thyroid. Types of hypothyroidism include primary, secondary, and tertiary.

Common Symptoms of Hypothyroidism

- Fatigue and morning grogginess
- Lower than normal resting (basal) body temperature
- Hair loss
- Cold extremities
- Constipation
- Sensitivity to cold temperature
- Greater susceptibility to colds and other viruses
- Depression and mood swings
- Weight gain
- Dry skin and dry brittle hair
- Headaches
- High cholesterol
- Menstrual irregularities and anovulatory cycles
- Goiter (enlarged thyroid gland)

Causes of Hypothyroidism

1. Iodine deficiencies
2. Toxicity/heavy metals
3. Candida
4. Environmental radiation
5. The following foods can suppress thyroid function, and, in some instances, may need to be limited to consumption less than four times a week:
    a. Brussels sprouts
    b. Mustard greens
    c. Spinach
    d. Cabbage
    e. Kale
    f. Peaches
    g. Pears
    h. Turnips
    i. Broccoli
    j. Cauliflower
    k. Soy
    l. Additionally, fluoride (found in most toothpaste and most municipal water sources) and chlorine (in tap water) can suppress thyroid function.

Foods and Drugs Affecting Thyroid function

The following foods may increase thyroid function:

- Seaweed
- Garlic
- Radishes
- Watercress
- Seafood
- Egg yolks
- Yogurt
- Cottage cheese
- Wheat germ
- Brewer's yeast
- Mushrooms
- Organic beef or poultry
- Sprouted beans
- Watermelon
- Tropical fruits
- Coconut oil

Drugs that may alter thyroid function:

- Amiodarone
- Iodine
- Clofibrate
- Estrogen
- Tamoxifen
- Androgens/Anabolic Steroids
- Glucocorticoids
- Slow-Release Nicotinic Acid
- Furosemide
- Heparin
- Hydantoins
- Non-Steroidal Inflammatory drugs (NSAIDs)
- Salicylates

Drugs that can interfere with absorption of thyroid replacement medication:

- Antacids
- Bile Acid sequestrants
- Calcium Carbonate
- Cation Exchange Resins
- Ferrous Sulfate
- Sucralfate

Laboratory Testing

- Physicians frequently screen for thyroid dysfunction with a TSH (thyroid stimulating hormone) or a T4 blood test. These tests may detect frank hypo- or hyperthyroidism, but may miss a low functioning thyroid. T3 levels are more likely than T4 to diminish with age.
    - Your doctor will measure free-T3, free-T4, and TSH levels.

Lifestyle Management of Hypothyroidism

Nutritional Support[1]

- Fresh whole foods
- Simple organic foods (low artificial or chemical content)
- Low-fat foods
- Lean protein: fish, poultry and meat (only organic/free range, without hormones or chemicals)
- Complex carbohydrates
- Foods to Avoid:
    - Salt
    - Fats
    - Caffeine
    - Alcohol
    - Sugar
    - Fast foods
    - Fried foods
    - Trans-fats (hydrogenated vegetable oils)
    - Goitrogens
        - Peanuts
        - Pine nuts
        - Cassava (tapioca)
        - Sorghum
    - Aspartame (Equal/NutraSweet)
    - Fast weight-loss diets
- Foods to Limit (one serving or less per day):
    - Dairy products and red meat (use only low fat/nonfat, organic, free-range)
    - Soy products
    - Cruciferous vegetables (Brussels sprouts, cabbage, cauliflower, broccoli)

[1] Shames, Richard L., MD, and Shames, Karilee Halo, RN, PhD, Thyroid Power – 10 Steps to Total Health, Harper Collins, 2001.

Lifestyle

- Avoid tobacco

Thyroid Replacement Therapy

Most synthetic thyroid replacement medications (e.g., Synthroid) only replace T4 and not T3. The body becomes less efficient converting T4 into T3 with advancing age, and may convert more readily to the metabolically inactive Reverse T3. Synthetic T4 does not consistently convert to T3 in all adults. Since adequate amounts of both are

necessary for proper thyroid function, a combination, using naturally derived compounded thyroid containing a mixture of T4 and T3 is often more effective.

Thyroid is best absorbed when taken in the morning on an empty stomach. Thyroid medication should be taken at least 4 hours apart from medications that influence absorption of thyroid hormones, such as antacids containing aluminum, Sucralfate, ferrous sulfate, and cholestyramine. Compounded naturally derived thyroid has a shorter duration of action than the synthetic formulations. Prescribing a micronized sustained release natural thyroid partially overcomes this limitation. Splitting the dose of natural thyroid into a morning and mid-afternoon administration generally provides a more even and consistent blood level. Avoid taking calcium supplements with the thyroid, as it will prevent absorption. Missed doses can be made up the following morning with the next dose.

Side Effects with Thyroid Replacement
Side effects are generally a result of too much thyroid or replacing it too quickly. Symptoms may include:

- Heart arrhythmias and rapid heart rate over 100 beats per minute
- Palpitations
- sleep disturbances
- Headaches
- Excitability
- Sweating
- Increased hunger and thirst
- Fine trembling of fingers
- Anxiety
- Increased metabolism
- Osteoporosis is a risk if TSH is suppressed too much. Generally bone loss does not occur unless it is in a female over 65 years, not receiving hormone replacement therapy
- Cardiac sensitivity is a contraindication to replacement therapy.

Monitoring
Your physician will check your blood levels frequently until optimal blood levels are achieved and stable. Generally, the best time to measure the level is around 4-5 hours after your morning dose. Once stabilized, your levels will be checked every 6-12 months or if you are symptomatic of abnormal levels.

Testosterone

Testosterone is a hormone secreted by the ovaries, adrenal glands and testes. Testosterone is the primary male sex hormone, responsible for male sexual development and critical in maintaining erectile function, libido, normal energy levels, and mood, and building muscles and burning fat. It is responsible for supporting immune function, bone density, and skin tone. It also controls a whole range of other physiological functions throughout the body in both males and females.

Testosterone levels decline with age. The decline begins when a man is in his mid to late 30s, and by the age of 80, is only 20% of what it was in youth. While the total testosterone does not drop drastically the free testosterone, which is the biologically active form, does decline dramatically with age. Free testosterone makes up about 2-3% of the total amount secreted. Increased estrogen levels and insulin resistance in men can also cause a drop in the free testosterone levels. It has been found that diabetic men with elevated hemoglobin A1C levels have lower levels of testosterone and this association is independent of obesity and body fat distribution.

The number of men in the U.S., between the ages of 45 and 70 years, is expected to increase from 46 million in 1990 to 81 million by 2020. Currently more than 5 million men in the United States suffer from the effects of hypogonadism or low testosterone levels.

Andropause – Male 'Menopause'
Andropause, also known as male androgen deficiency syndrome, is the male equivalent of female menopause. It results from diminished levels of testosterone in the body along with a relative increase in estrogen, and exhibits a similar symptom complex to female menopause. The enzyme system called aromatase (found mainly in fat cells) converts a portion of testosterone into estrogen. Because the drop in testosterone is more gradual, the symptoms of andropause appear over a longer period of time as compared to the female menopause. Symptoms present slowly, with a loss of overall energy, thinning bones and muscles, increased body fat, depression, and impaired sexual function.

Symptoms associated with Low Testosterone Levels

- Decrease in spontaneous early morning erections
- Decreased libido
- Decrease in fullness of erections
- Decrease in volume of ejaculate or strength of climax
- Difficulty starting or maintaining an erection
- Lack of focus and mental sharpness
- Fatigue
- Forgetfulness
- Mood swings
- Unexplained depression
- Increased body aches and stiffness

- Flabbiness and muscular weakness
- Decreased energy and stamina
- Arthritis and osteoporosis
- Rise in blood pressure or blood sugar level
- Weight gain
- Loss of lean body mass
- Changes in sleep patterns
- Hot flashes

Testosterone deficiency has also been linked to hypertension, obesity and increased risk of heart disease. Men with heart attacks often have lower levels of testosterone and higher levels of estrogen. Low free testosterone is an independent predictor of the degree of coronary artery disease in men. Low testosterone is also a common characteristic in men suffering from heart failure. Testosterone replacement increases cardiac output in men with congestive heart failure.

The prostate gland enlarges when a man's testosterone levels decline (especially with a diminished testosterone-to-estrogen ratio).An enlarged prostate gland has been associated with a greater risk for cancer of the prostate. Many doctors still believe that testosterone augmentation causes prostate cancer. The preponderance of evidence indicates otherwise. Testosterone has been shown to protect prostate size and function. It is possible, however, that it can accelerate existing prostate cancer and cancer-screening tests are necessary prior to replacement therapy. If prostate cancer is present and has spread outside the prostate then testosterone can accelerate its growth. Testosterone replacement therapy is therefore contraindicated in men with known prostate cancer.

<u>Andropause and Aging-related Diseases</u>

- A range of cardiovascular diseases
    - Heart attack
    - CHF
    - Stroke
    - Hypertension
- Alzheimer's dementia
- Type II diabetes
- Abdominal obesity
- Osteoporosis
- Arthritis
- Muscle wasting
- Depression
- Cognitive decline
- Loss of libido
- Inability to achieve erection
- Inflammatory-related syndromes

Negative Effects of Low Testosterone on Cardiovascular Disease

- Cholesterol, fibrinogen, triglycerides, and insulin levels increase
- Coronary artery elasticity diminishes
- Blood pressure rises
- Human growth hormone (HGH) declines, weakening the heart muscle
- Abdominal fat increases, increasing the risk of heart attack

Testosterone and Heart Disease

- Low testosterone correlates with heart disease more reliably than does high cholesterol
- Testosterone slows the rate of vascular smooth muscle proliferation and apoptosis
- Testosterone may maintain the fibrous cap of atherosclerotic plaque by smooth muscle stability
- Testosterone strengthens the heart muscle
- There are more testosterone receptors in the heart than in any other muscle
- Testosterone lowers LDL and total cholesterol
- Transdermal testosterone raises HDL cholesterol
- Testosterone raises apolipoprotein A
- Testosterone can improve or eliminate arrhythmia
- Testosterone improves symptoms of angina, probably through vasodilation of coronary arteries
- Testosterone prevents blood clots

Testosterone and Stroke Risk

- Men with low testosterone have greater progression of carotid intima-media thickening
- Low free testosterone levels are related to intima-media thickening of the common carotid artery in elderly men independently of cardiovascular risk factors

Testosterone and Chronic Heart Failure

- Low testosterone is a common characteristic in men suffering from heart failure
- Testosterone
    - increases anabolic function
    - Improves arterial dilation
    - Augments cardiac output
    - Has anti-inflammatory activities
- Trend toward improved mood scores with testosterone replacement
- Men with chronic heart failure have high rates of depression

Testosterone and Prostate Cancer Risk

- The preponderance of the evidence indicates that testosterone does not cause prostate cancer
- Testosterone has been shown to protect prostate size and function. The prostate grows in low testosterone levels

- Men with prostate cancer cannot take testosterone-boosting therapies because it stimulates the proliferation of existing prostate cancer cells

Testosterone and Depression

- Low testosterone correlates with symptoms of depression and other psychological disorders
- Testosterone replacement in men has been shown to significantly reduce
    - depression scores
    - Fatigue
- Libido
    - Prescription antidepressants have a common side effect of loss of libido
    - Testosterone replacement enhances libido

Testosterone and Mental Decline

- Low levels of testosterone
    - Are found in men with Alzheimer's disease compared to controls, independent of confounding factors
    - May contribute to memory impairment and increase brain vulnerability to Alzheimer's and related disorders
- Testosterone
    - exerts neuroprotective benefits from the effects of beta-amyloid
    - Decreases secretion of beta-amyloid
    - May be beneficial in the treatment of Alzheimer's

Testosterone and Obesity

- Obese men have low testosterone and high estrogen levels
- Fat cells, especially in the abdomen, convert testosterone to estrogen
- Central or visceral obesity is a risk factor for
    - Cardiovascular disease
    - Type-II diabetes
- High-fat foods may reduce free testosterone levels
- Testosterone plays a regulatory role in counteracting visceral fat accumulation
- Boosting testosterone levels can
    - Decrease abdominal fat
    - Reverse glucose intolerance
    - Reduce lipoprotein abnormalities

Testosterone and Osteoporosis

- An important risk factor for osteoporosis and fractures in men
- Testosterone stimulates osteoblasts and therefore new bone formation
- Men with testosterone deficiency have significant decreases in bone density
- In men older than 65 years of age, the incidence of hip fractures is nearly 5 per 1000
- Approximately 30% of all hip fractures occur in men
- Testosterone deficiency has been reported in more than 50% of men with a

history of hip fracture

Testosterone in Women

Most of the research on testosterone replacement has focused on men. Nevertheless, healthy women naturally have small amounts of testosterone. It is produced primarily in the ovaries. Testosterone levels tend to peak when a woman is ovulating, increasing libido for reproduction. It also appears to enhance the function of estrogen and progesterone. Women who replace progesterone without testosterone often require slightly greater doses of progesterone. Testosterone may also improve various symptoms of menopause including 'hot flashes," weight gain, fatigue, lethargy and may decrease the risk of breast cancer.

Most women begin to experience symptoms of testosterone deficiency after menopause, when their testosterone levels generally decline by about 50%. However, a variety of conditions can cause a decline long before menopause. Some of these conditions include childbirth, endometriosis, birth control pills, ovarectomy, depression, and abuse of alcohol and narcotics. Additionally, some medications may interfere with the bioavailability of testosterone, such as Provera, Prozac and Zoloft or other antidepressants, and some antipsychotic medications.

Typical symptoms experienced by women with low testosterone levels include

- Decreased libido
- Orgasms may be absent or significantly decreased
- Sexual fantasy may be significantly decreased or absent
- Vaginal dryness
- Lack of energy and stamina
- Flabbiness and muscular weakness
- Diminished overall vitality
- Loss of hair
- Loss of coordination and balance
- Decreased armpit, pubic and body hair
- Memory loss
- Arthritis
- Bladder symptoms
- Depression

Common Factors that Can Reduce Total Testosterone Production

- COPD/hypoxia
- Asthma
- Corticosteroid use
- Presence of cancer
- Cancer chemotherapy
- Obesity
- Malnutrition
- Critical illness

Some drugs and substances compete for testosterone cellular receptors or change metabolism indirectly, resulting in the same effect as a low testosterone level

- Antifungal drugs (as above)
- Pesticides
- Spironolactone
- Some cancer chemotherapy drugs
- Thiazide diuretics
- DHEA

Estradiol's Relationship to Testosterone

The enzyme system called aromatase, found mainly in fat cells, converts a portion of testosterone to estrogen. Rising estrogen levels reduce the available free testosterone. The testosterone-to-estrogen ratio in men generally increases with age.

Many lifestyle behaviors are directly related to estrogen elevations. The most common causes of midlife estrogen increases in males include:

- Age-related increases in aromatase activity
- Alteration in liver function
- Zinc deficiency
- Obesity
- Overuse of alcohol, which decreases key estrogen metabolizing enzymes in the liver, such as the P450 enzyme system
- Drug-induced estrogen imbalance
- Ingestion of estrogen-enhancing food or environmental substances
- Excess testosterone by injection
- High cortisol levels

Factors that increase aromatization of testosterone to estrogen include

- Age
- Genetics
- Obesity
- High cortisol levels. Triggers for cortisol include:
    - Low carbohydrate intake
    - Skipping meals
    - Dieting
    - Chronic stress
    - Chronic lack of sleep
    - Alcohol
    - Glucocorticoid steroids
    - Overdoing exercise
- High-fat diet
- Alcohol
- Grapefruit
- Low soy intake
- Zinc deficiency (e.g., from diuretics, diet, age, illness)

- Vitamin C deficiency
- Impaired liver function, or drugs which impair liver function
    - a healthy liver eliminates surplus estrogen and SHBG
    - NSAIDs
    - Statins
    - Some heart and blood pressure medications
    - Some anti-depressants
- Diuretics
- Excess testosterone injection (less-so with transdermal and even less with pellet delivery system)
- Hypothyroidism – low T3
- Hyperinsulinism
- Proinflammatory cytokines – COX-2, IL-6, TNF alpha
- Increased growth hormone levels
- Low melatonin levels

Andropause Screening
Your doctor will make the diagnosis of andropause based upon your symptoms, physical findings and blood tests.

Laboratory
Symptoms of testosterone deficiency may arise even when a laboratory test indicates a "normal" level. The reason is that many lab tests do not address the amount of "free" testosterone available to deliver the desired benefits. "Free" testosterone refers to the amount of circulating testosterone most biologically available. In addition, the presence of other hormones can influence the levels of free testosterone.

Management of Low Testosterone Levels
One way to help maintain (if not actually increase) testosterone levels is by reducing excess body fat. Weight training is another way to raise testosterone levels in both males and females. Additional lifestyle changes include avoiding excess alcohol and high-fat diets, increasing intake of soy products, taking caution with drugs that impair liver function, and managing stress. Avoid over-the-counter agents promising to improve testosterone levels, such as androstenedione. Testosterone replacement therapy, when prescribed by your physician, can dramatically augment the benefits of these lifestyle changes.

In general, natural testosterone replenishment for andropausal men has the potential to prolong the quality-of-life by decreasing many diseases of aging. Testosterone protects against cardiovascular disease; it can raise HDL cholesterol, and lower LDL cholesterol levels. It can decrease blood pressure, excess body fat, and symptoms of arthritis. Testosterone is a memory enhancer for many men. It stimulates the cardiovascular system, the neurologic system, muscles, bones and the vascular system. It prevents tendon and joint degeneration and osteoporosis.

Testosterone Replacement Therapy
Studies over the past decade show that replacing testosterone can help restore men's health. Men receiving testosterone replacement are more likely to experience:

- Increased bone density, bone formation and bone minerals.
- Increased energy
- Improvement in sexual function and desire
- Decreased body fat
- Increased muscle strength, and diameter of muscle fibers
- Improved blood glucose levels
- Decreased blood pressure
- Lower cholesterol and triglycerides
- Increased HDL cholesterol (transdermal testosterone)
- Increased apolipoprotein A and decreased lipoprotein A
- Decreased heart disease
- Improvement in autoimmune disorders
- Improved wound healing
- Improved urinary function

Researchers report that women who receive testosterone replacement therapy after menopause experience an increase in sexual drive and response, frequency of sexual intercourse, number of sexual fantasies, and level of sexual arousal. Testosterone generally helps control a woman's libido, and is known to improve clitoral and nipple sensitivity as well as the quality of orgasm.

Testosterone contributes to overall muscle tone. Prior to menopause, many women experience the embarrassment of a leaky bladder. This problem may be related to diminishing testosterone levels, because the pelvic muscles are particularly dependent on testosterone. Many women find that testosterone replacement, combined with Kegel exercises, strengthens and tones those muscles.

Recent research suggests that testosterone may increase the bone's ability to retain calcium. Women who experience very rapid bone loss are typically deficient in both estrogen and testosterone. It appears that both testosterone and estrogen independently improve bone density.

Regimens of Administration and Usual Starting Dose
Testosterone can be replaced with oral medication, by injection, with implantable pellets, patches, and creams. Each may have advantages and disadvantages. Your doctor will help you determine the best form of administering testosterone replacement.

Monitoring Testosterone Replacement
Your physician will monitor blood levels every few months until dosages are adjusted to achieve optimal levels and outcomes.

Side Effects Associated with Testosterone Replacement

Side effects may include:

- The most common immediate side effects (occurring in approximately no more than 6% of users) include:
  - Acne, not limited to the face; could be on the back sides
  - Oily skin
  - Application site reaction
  - Headache
  - Hypertension (high blood pressure)
  - Abnormal liver function tests
  - Non-cancerous prostate disorder
  - Greasy hair
  - Strong body odor
  - Aggressiveness; bossiness
- Scalp hair loss
- Growth of facial hair
- An increase in hemoglobin and hematocrit (Hgb and Hct)
  - more common when replacement is by injection
  - may be treated by donating blood or therapeutic phlebotomy
- Male pattern baldness and gynecomastia (breast enlargement) can occur when too much of the testosterone is aromatized to estrogen.
- Diminished sperm production and a 25-30% reduction in the size of the testicles may develop. Excess doses of testosterone may suppress FSH enough to inhibit sperm production.
- In insulin-dependent diabetics, testosterone replacement may reduce insulin requirements.
- The concurrent use of testosterone with corticosteroids may enhance edema formation.
- Testosterone replacement may also increase clearance of the drug propranolol.
- Geriatric patients may be at a slightly increased risk for the development of prostate enlargement when replacing testosterone.
- Edema may be a complication with testosterone replacement in patients with pre-existing cardiac, renal, or hepatic disease, secondary to sodium retention.
- Insomnia or sleep disturbances. Replacement therapy may potentiate sleep apnea in some chronic disease patients, although studies have shown it can actually ameliorate symptoms of sleep apnea.
- Could turn occult prostate or breast cancer lesions into active ones

Many physicians still hesitate to prescribe testosterone replacement for women because of the potential virilizing side effects. While excessive doses of testosterone can lead to “masculine” characteristics, a typical woman’s dose would be so small that these effects are rare. Additionally, many of the reported side effects from testosterone are those associated with synthetic testosterone-like drugs, not natural bio-identical testosterone. While side effects are uncommon, if they occur, back off on the dose of the testosterone and notify your physician.

Concurrent Nutritional Supplementation

The following nutritional supplementation is frequently recommended whenever testosterone replacement therapy is used

- DIM or Indole-3-Carbinol
- Chrysin, if estradiol levels climb in males
- Beta Sitosterol

Your doctor will determine if one of more nutritional supplements may be advisable for you.

Estrogen and Progesterone

Female Hormone Replacement Therapy – Controversies

Few topics in medicine have created more confusion for millions of women than the controversies surrounding hormone replacement therapy (HRT). For many years, physicians recommended HRT to menopausal women, based upon studies demonstrating significant health benefits and protection against everything from heart disease and osteoporosis, to colon cancer and Alzheimer's disease. Then, in a sudden about-face, along came a study that lead to a mass discontinuation of HRT. Findings from the Women's Health Initiative (WHI) suggested that the risks associated with HRT use outweighed any benefits. The new evidence showed an increased risk for heart disease, breast cancer and strokes. How could the WHI conclusions about the safety of HRT be so conflicting with previous studies and result in a virtual flip-flop in the medical advice given to women? As the dust has settled and after more in-depth analysis, it appears there is some truth in all the studies. The secret is in understanding what each one is telling us.

Physician guidelines regarding hormone replacement therapy were previously driven by findings from a number of research studies such as the Nurses' Health Study, a 20-year prospective cohort study of 120,000 women under age 55. It found that HRT use was associated with significant reductions in cardiac events as well as cardiovascular and total mortality. The more recent Women's Health Initiative, a 5-year randomized trial with 16,000 women, found an increased incidence in cardiac events associated with HRT, although with no increase in either cardiovascular or total mortality. Why are the conclusions at variance? The truth is that the outcomes from both studies were largely correct. They were both right but differed principally in the timing when hormone replacement therapy was initiated. Women in the Nurses' Health Study generally started HRT within 2 years of menopause, while those in the WHI did not start HRT until 10 years after menopause.

Estrogen is thought to have protective properties against cardiovascular disease in premenopausal women, and that the risk for atherosclerosis begins to rise as estrogen levels decline after menopause. Substantial evidence supports the use of hormone replacement therapy for the primary prevention of atherosclerosis in women, but only if started during the early postmenopausal period and before the onset of atherosclerosis. Once atherosclerosis has already developed, however, HRT has no effect at reversing the process and may actually promote plaque destabilization and thrombosis. This largely explains the different outcomes from the Women's Health Initiative compared to earlier studies.

What about an increase in cancer risk with hormone replacement therapy? The WHI consisted of two clinical arms. The first arm was the Hormone Replacement Therapy (HRT) trial, using estradiol (an oral form of estrogen) and progestin (an oral form of synthetic progestin, known as medroxyprogesterone acetate). The Estrogen Replacement Therapy (ERT) trial made up the second arm, using only estrogen. The HRT trial found 8 more cases of breast cancer but 6 fewer cases of colon cancer for

every 10,000 women, compared to the control group. On the other hand, women receiving only estrogen in the ERT trial demonstrated a small, though not statistically significant, reduction in breast cancer cases, in addition to fewer cases of colon cancer. Several observational studies also found HRT to be associated with reduced mortality for cancer of the colon. The conclusion from this and previous studies is that the progestin used in the HRT trial of the WHI increases a woman's risk for breast cancer. Progestin appears to be the culprit regarding breast cancer risk, not estrogen. It is noteworthy that the WHI found no increase in breast cancer deaths or total cancer deaths in either trial.

It is worth noting the following facts about the women in the WHI trials: It was a 5-year trial of 16,000 women, with a mean age of 63.3 years, 70% of the women had a body mass index (BMI) greater than 25 (classifying them as either overweight or obese), nearly 50% smoked, and some of the women already had pre-existing heart disease. In other words, a significant percentage of the women in the trial were already at risk for heart disease. Moreover, the women given estrogen and progestin were dosed using a continuous dose, orally, of each hormone. As previously mentioned, one of the most noteworthy facts is that hormone replacement therapy (HRT) was initiated several years post-menopause in many of the women, the mean age being 63.3 years when HRT was introduced for the first time.

Two more recent investigative studies have been published which provide additional support to the relative safety of using HRT. The National Health and Nutrition Examination Survey (NHANES) and the Iowa Women's Health Study (IWHS) reported no increase in risk of breast cancer. The NHANES was a large prospective study based on a nationally representative sample of the U.S. population followed for 22 years. The IWHS grouped breast cancer into three groups: ductal carcinoma in situ, cancer with favorable histologic finding and invasive ductal lobular carcinoma. No increase risk for breast cancer was associated with HRT treatment. Furthermore, women who did develop breast cancer on HRT were highly associated with favorable prognostic histological findings.

Yet another recent study, from the University of Southern California (USC), found virtually no increased risk with continuous combined HRT. Long term HRT (10-15 years) conferred no greater risk for breast cancer than non-use, and carcinomas that did develop had a better prognosis than the other types. Finally, ERT compared to non-use gave protection against the development of cardiovascular disease. For each case of breast cancer, more than six deaths from heart disease were prevented with ERT use.

Of perhaps greater concern for women than breast cancer is osteoporosis. One in six Caucasian women in the U.S. will fracture her hip, and this is greater than the risk of developing breast cancer or gynecological cancer. In white women 50 years and older, the lifetime risk of osteoporotic fractures approaches 40 percent. To make matters worse, as many as 33% patients die within one year of hip fracture. Osteoporosis is responsible for almost 1 million vertebral and hip fractures annually. The Women's

Health Initiative demonstrated that hormone replacement therapy is associated with a 35% reduction of hip fractures.

Hormone replacement therapy has beneficial effects in conditions other than cardiovascular disease, cancer, and osteoporosis. Some studies have shown that HRT is associated with a reduction of cases of new-onset diabetes mellitus by as much as 35%, and a 60% reduction in recurrent urinary tract infections. Diabetic women who use hormone replacement therapy are more likely to have their blood sugar under control and have lower cholesterol levels than women who never used hormone therapy. Glycosylated hemoglobin, HbA1c, an indicator of poor blood sugar control, tends to be lower amount diabetic women using HRT. HRT users tend to have higher levels of ApoA, a protein component of HDL that allows it to remove excess cholesterol from the blood stream. HRT appears to lower levels of Fibrinogen, a protein associated with increased risk of coronary heart disease. Moreover, it may reduce the risk for Alzheimer's disease. In cell cultures, gender-specific bioidentical estrogen or testosterone supplementation appears to slow the accumulation of tau protein, neurofibrillary tangle, and amyloid in human neurons, reducing the potential for Alzheimer's disease.

Findings from a meta-analysis of 30 randomized controlled trials involving hormone replacement therapy were published in a 2004 issue of the Journal of General Internal Medicine. The analysis included several notable trials, such as the Women's Health Initiative. The authors concluded that while the risks of initiating HRT in older women or in the presence of coronary heart disease may outweigh the benefits, HRT use was not associated with any change in mortality. Furthermore, the authors concluded that the benefits of HRT outweigh the risks if treatment is begun in younger women who do not have coronary heart disease or breast cancer. The report found that initiating HRT in younger postmenopausal women actually resulted in a 39% reduction in mortality.

Current guidelines for hormone replacement therapy have confined its use to short-term symptom treatment only, using the lowest dose possible. A better understanding of the seemingly conflicting evidence suggests that hormone replacement therapy can still provide significant health protection for many women.

Estrogen

Estrogen is a hormone made primarily in the ovaries. Some testosterone is also converted to estrogen through an enzyme process known as aromatization. "Estrogens" are the primary female sex hormones. The three major estrogens are estradiol, estriol and estrone. Of the three, estradiol is the most physiologically and biologically active. This synthetic formulation is most commonly prescribed in its conjugated form, such as Premarin. Synthetic estradiol is frequently not well absorbed and may result in some unwanted side effects. Estrone, known to relieve some of the symptoms of menopause, is sometimes selectively used in bio-identical hormone replacement therapy. Some of the metabolites of estrone, however, have genotoxic effects, and are associated with some forms of cancer. The third major estrogen, estriol, is considered a weak estrogen. And while it is beneficial, such large doses are

required to treat menopausal symptoms, compared to estradiol that frequently the side effects are too much for women to handle. Huge amounts of estriol are produced during pregnancy. However, it should be noted that estriol is the only form of the three that has actually been shown to have an anti-cancer effect. It is commonly combined with estradiol for hormone replacement therapy.

Estrogen is not simply a sex hormone, but a total body hormone. Some of the hormone receptor sites that need estrogen are found in the bladder, bones, arteries vagina, heart, liver and the brain. Without adequate levels of estrogen these organs cannot function properly.

Estrogen has been shown to protect against:

- Colon cancer
- Osteoporosis (with estradiol blood levels > 50-75)
- Heart disease
- Stroke
- Increased cholesterol
- Incidence of Alzheimer's
- Memory loss
- Symptoms of menopause

Between the age of about 35 and 50 years, estrogen levels decline slowly, by approximately 25 percent. Female hormone levels of estrogen drop drastically at menopause. After menopause heart disease in women skyrockets, surpassing the rate found in the male population. In fact, it is the leading cause of death in older women with over a half-million deaths per year in the US, more than twice as many as all cancer deaths combined. Young women, who make large amounts of estrogen, rarely have osteoporosis, macular degeneration, or osteoarthritis, and they rarely die of cancer, heart disease Type II diabetes, or Alzheimer's disease. Young women, too, overall, are not incontinent, too cold, too hot, or plagued by unrelenting insomnia.

The Women's Health Initiative (WHI) study demonstrated an increased risk overall with the synthetic hormones. While the study found a statistically significant reduction in colon cancer and osteoporosis, a statistically significant increase in the incidence of breast cancer, heart attacks and strokes was noted.

Recall that more recent analysis of the WHI data suggests that HRT actually reduces the risk for heart disease when administered among women in their early 50s, yet may have harmful effects when therapy is initiated among women a decade older. The reason is that estrogen has both beneficial and harmful effects on plaques of atherosclerosis – the cause of heart attacks.

To understand this issue it helps to know how heart attacks happen. Plaques of atherosclerosis form in the heart's arteries. Each plaque develops a cap made of thin fibers. Cholesterol lies beneath this cap. Heart attacks and many strokes occur when the cap ruptures, spilling cholesterol into the middle of the artery. After that, a blood clot

forms and the artery constricts to slow the flow of blood to a part of the heart muscle, starving it of the oxygen and sugar it needs.

Estrogen, particularly the bioidentical form, slows the development of atherosclerotic plaques, by lowering LDL ("bad") cholesterol, raising HDL ("good") cholesterol levels, and reducing other markers of inflammation. Estrogen has an antioxidant effect on free radicals, which helps prevent harmful oxidation of LDL cholesterol. Taking a vitamin E supplement helps the antioxidant effect of estrogen. Estrogen also produces vasodilatory factors such as nitric oxide and prostacyclin and inhibits synthesis of the vasoconstrictor, endothelin-1. The net result is a decrease in vascular resistance and lower blood pressure.

For this reason it may be desirable that women begin estrogen replacement therapy early in menopause, before estrogen levels have been low long enough to allow atherosclerotic changes to begin. In other words, HRT may decrease the risk of heart disease in relatively younger women by slowing the development of plaques. However, estrogen may make existing plaques more likely to rupture by increasing inflammation in them. This is why it may be harmful to wait and initiate estrogen replacement therapy in much older women and in women with pre-existing atherosclerosis. The WHI outcomes suggest that this is true. The risk of developing heart disease was lower for women taking HRT at younger ages, but it was higher for women starting hormones many years after menopause, particularly with known atherosclerosis. The bottom line is that estrogen and progesterone is not for every woman.

As previously discussed, estrogen replacement therapy does not appear to increase the risk of breast cancer, but rather the synthetic progestin (medroxyprogesterone acetate) does. Additional factors may contribute to an increased incidence of breast cancer, such as toxic substances found in many food and water that accumulate in fat cells, including fat cells of breast tissue. Soy estrogens block the effect of these toxic substances and therefore further protect a woman from getting breast cancer.

Characteristics of Estrogen Deficiency

- Mental fogginess
- Forgetfulness
- Depression
- Minor anxiety
- Mood changes
- Difficulty falling asleep; insomnia
- Hot flashes – vasomotor hot flashes do not correlate with estrogen levels
- Night sweats
- Temperature swings
- Day-long fatigue
- Decreased sense of sexuality
- Decreased libido
- Harder to reach climax
- Pain with sexual activity
- Dry eyes, skin and vagina

- Lessened self-image
- Sagging breasts and loss of fullness
- Bladder symptoms
- Breakthrough bleeding
- Dry skin or hair
- Hair loss

Characteristics of Estrogen Dominance (ratio of estrogen to progesterone is too high, even if the absolute level of estrogen is low)

- Premenstrual mood swings, depression
- Impatient, snappy behavior
- Breast swelling, fibrocystic breasts
- Increase of breast size
- Craving for sweets
- Heavy or irregular menses
- Pelvic cramps
- Sleep disturbances: insomnia or heavy fatigue
- Uterine fibroid
- Weight gain, fat deposition at the hips and thighs
- Acne, skin break-out
- Water retention, edema

Estrogen in Men

Many men who can boast normal levels of testosterone nonetheless exhibit characteristic symptoms of the male menopause. They find their energy diminishing and their sexual life faltering. If this situation is due to a hormonal imbalance, it may not be related to testosterone. Frequently it is in the level of estrogen, the female hormone, where the trouble lays.

Men react with surprise when they learn the male body contains its own natural supply of estrogen. They are equally unprepared for the news that estrogen is a normal aspect of their hormonal makeup. The male body actually manufactures the female hormone from testosterone. An enzyme in the body, aromatase, converts a small portion of testosterone into estrogen, a process necessary for the healthy functioning of estrogen-sensitive tissues in a man's body.

It is likely that estrogen is beneficial to the male brain. Estrogen is definitely important in influencing certain natural sexual functions through its effects on brain chemistry. The very areas of the brain involved with sexual function require estrogen for its special purposes in those specific locations. When it comes to estrogen levels, however, the effective range in the male body is very narrow. Too little estrogen will neuter a man just as effectively as too little testosterone. Low levels of estrogen may be harmful to the brain and bone density. Too much estrogen can displace testosterone at various cellular receptor sites, switching off important cellular activities.

As we grow older, aromatase levels tend to increase, resulting in greater estrogen production. In addition, methods for eliminating estrogen, once it has been created, decline. Consequently, the middle-aged man becomes estrogen dominant. By the time a man reaches his fifties, the estrogen level in his body may actually exceed that found in a menopausal woman on estrogen replacement therapy. The changing ratio of testosterone to estrogen is a major factor underlying a common form of male menopause known as metabolic andropause. The testosterone: estrogen ratio is more important than the absolute level of estrogen.

Estrogen Dominance in Men

Estrogen dominance develops slowly in men. The most common causes of midlife estrogen increases in males include:

- Age-related increases in aromatase activity
- Obesity
- Alteration in liver function
- Zinc deficiency
- Overuse of alcohol
- Drug-induced estrogen imbalance
- Ingestion of estrogen-enhancing food or environmental substances
- Excess testosterone by injection
- Chronic stress; cortisol competes with progesterone at the progesterone receptors, losing the counterbalancing effect of progesterone.

High estrogen levels are associated with increased risk of heart attacks in males – the exact opposite of its effect in females, in whom it has cardioprotective effects, dilating the coronaries, decreasing clotting factors and revving up the body's natural clot-busting system. Increasing levels of estrogen in men may adversely affect the prostate gland. Some studies have found that men with higher estrogen levels are more likely to develop benign prostatic hypertrophy. In many men, high estrogen levels cause an actual reduction in testosterone production, and reduce the effective availability of testosterone. A relative excess of estrogen to testosterone diminishes male sexuality. By overlooking the effects of estrogen in males, physicians have found themselves at a loss to explain the failure of testosterone replacement therapy in men who seem ideally suited to it. Observations of these failures have lead many physicians to conclude that testosterone is not significantly related to male midlife changes. In such instances, the failure may be in neglecting the other side of the equation – estrogen.

The problem of estrogen dominance may not simply be a result of natural metabolic changes in hormone conversion and in hormone excretion. The environment and many foods we consume expose us to numerous synthetic estrogens. Many herbicides and pesticides produce an estrogenic effect. Several of the chemicals given to livestock and poultry are estrogenic.

Common causes of elevated estrogen levels in men should be addressed first whenever the levels climb. Fat cells convert testosterone to estrogen. Moreover, obesity is associated with lower testosterone levels. If you are overweight, begin a

calorie-restricted, Mediterranean-type diet, with minimal or no grains. As the pounds drop off, so will many of the symptoms of male menopause. Increasing consumption of cruciferous vegetables, such as broccoli and cauliflower, will stimulate removal of excess estrogen. The phytoestrogens in a diet rich in soy compete with estrogen receptor sites, block its actions, and stimulate the liver to process and excrete excess estrogen. Avoid grapefruit, as it tends to inhibit the liver's breakdown of estrogen. Alcohol significantly inhibits clearance of estrogen from the blood and reduces zinc levels. Consider reducing consumption of alcohol or give up drinking altogether.

Some nutritional supplements have been found to help restore a proper balance of estrogen to testosterone. Many men can reduce estrogen levels by supplementing with zinc, which inhibits the conversion of testosterone to estrogen. Vitamin C and chrysin may further improve the testosterone to estrogen ratio slightly.

A number of prescription and over-the-counter medications have the potential to increase estrogen levels. They include some drugs within the following categories: anti-inflammatory drugs, cholesterol lowering drugs, anti-depressants, heart and blood pressure medicine, antibiotics and antifungal agents.

Symptomatic estrogen dominance that is unresponsive to the measures outlined may require prescription intervention that is more intensive, such as an aromatase inhibitor, e.g., Arimidex.

Progesterone

Progesterone, primarily a female hormone but also found in males in small amounts, is made in the ovaries, the adrenal glands, and in the placenta during pregnancy. It is one of the major regulatory hormones. Without it rising cyclically, the woman becomes, on the cellular level, out of control. Like estrogen, progesterone levels decline with age. Female progesterone levels drop drastically at menopause.

Benefits of Progesterone

Progesterone helps estrogen levels remain within a therapeutic range and therefore, can protect against endometrial cancer of the uterus. Progesterone also:

- Stimulates osteoblasts, protecting against osteoporosis by promoting bone growth. The effect of progesterone on bone health may be of greater significance than estrogen's effect of delaying the loss of old bone.
- Downregulates estrogen receptor sites
- Protects against breast cancer
    - Enhances a protective gene system (known as P53), which slows down another gene system (BCL2) that promotes cancer
    - Down-regulates a gene that acts similar to cancer-promoting BCL2
    - Prevents cells from proliferating excessively in breast and uterine tissue
    - Enhances natural killer cells and interleukin-2
    - Increases apoptosis. This process deters cells from mutating into harmful forms due to oxidative and chemical reactions in the body. Estradiol slows down apoptosis

    - Reduces the ability of breast cancer cells to metastasize
    - Natural progesterone protects against breast cancer by decreasing ductal cell proliferation. It can decrease ductal stimulation by 400%
- Increases the production of the anti-cancer estrogen known as estriol
- Useful for patients with estrogen-receptor positive breast cancer
- Decreases fluid retention; it is a natural diuretic
- Normalizes blood clotting
- Helps maintain normal blood sugar levels
- Assists in lowering LDL cholesterol levels. Micronized progesterone and estrogen lead to the greatest improvement in raising HDL and lowering LDL
- Improves libido
- Has a sedative effect on the central nervous system
- Protects brain cells
- Increases the sense of well-being
- Stabilizes mood
- Anti-estrogenic
    - Suppresses nuclear estradiol receptors
    - Induces estradiol dehydrogenase 17 beta-HSD 2,4
    - Suppresses DNA synthesis
    - Increases the sulfotransferase activity
- Suppresses conversion of testosterone to DHT
- Is a precursor for cortisol
- Blocks binding of Aldosterone to renal receptors, can lower circulating testosterone
- Supports the thymus
- Increases ventilatory chemoresponsiveness
- Reduces NFk-beta
- Natural progesterone, but not Provera, enhances the beneficial effect of estrogen on exercise-induced myocardial ischemia in postmenopausal women

Causes of Low Progesterone

- Aging
- Impaired production
- Low LH
- Increased prolactin production
- Stress
- Antidepressants
- Excessive arginine consumption
- Sugar
- Saturated fat
- Deficiency of vitamins A, B6, C, Zinc
- Decreased thyroid hormone

Natural Progesterone

- Is a precursor to estrogen and testosterone
- Helps balance estrogen
- Increases the breakdown of fat
- Lowers blood pressure
- Reduces arterial spasms
- Is anti-proliferative and may protect against some forms of cancer, such as breast cancer
- Protects against endometrial hyperplasia as well as medroxyprogesterone acetate (e.g. Provera)
- Reduces breast density
- Maintains endometrium of the uterus and protects against endometrial cancer
- Is a natural diuretic
- Natural calming effects and is a natural anti-depressant
- Improves mood
- Restores libido
- Inhibits cholesterol buildup
    - Increases HDL
    - Lowers LDL
    - Reduces foam cell formation
- Prevents osteoporosis by stimulating osteoblasts to form new bone and by interfering with glucocorticoids, which cause bone loss
- Leaves the body quickly
- Improves sleep
- Increases scalp hair
- Helps balance fluids in the cells
- Increases the beneficial effects of estrogen on BV
- Increases metabolic rate

Synthetic Progestins

- Is a teratogen
- Increase the risk of birth defects, such as heart and limb defects, if taken during the first four months of pregnancy
- May increase blood pressure
- May lead to sudden or partial loss of vision, thrombophlebitis, pulmonary embolism and cerebral thrombosis
- Increase the risk for coronary artery spasms
    - Worse cardiac outcomes with estrogen than progesterone and estrogen
- May cause fluid retention
- May cause or contribute to depression
- May cause acne, alopecia and hirsutism
- Decreases T3 thyroid uptake and thyroid regulation
- When taken with estrogens, symptoms may be worse: Increases estrogen dominance
- Stimulates estrogen receptor sites

- Have negative effects on lipids (negates estrogen's lipid lowering properties)
    - Lowers HDL
    - Raises LDL
    - Increases foam cell formation
- Increases endothelial dysfunction
- Increases breast density

Provera is an FDA-approved synthetic progestin. Progestins are not the same as natural progesterone. Synthetic progestins may produce unwanted side effects such as fluid retention, weight gain, depression and breast tenderness. Progestins tend to cancel the protective effect of estradiol, and promote constriction of the coronary arteries to a significant degree. Natural progesterone, on the other hand, protects the endometrium, preserves the beneficial effects of estrogen on the cardiovascular system and has no negative effects on the blood vessels that supply your heart. Provera has many known potential dangers such as possible birth defects, damage to nerve cells, blood clots, acne, rashes, and breast cancer. Synthetic progestins also tend to make you nervous and can adversely affect your ability to sleep.

Progestins are unnatural drugs that have more side effects than natural hormones. Hormone supplementation with the natural, bioidentical form of the hormone will always have fewer side effects than the patentable analogs. Natural micronized progesterone is made from plant sources; more specifically the wild yam. The molecule is altered to make it bio-identical to human progesterone. Replacement therapy is dosed based upon a woman's serum progesterone level and her symptoms.

Signs and Symptoms of Low Progesterone

- Acne
- Amenorrhea – no periods
- Oligomenorrhea – the periods come infrequently
- Heavy and frequent period
- Spotting a few days before the period
- Anxiety
- Arthritis
- Breakthrough bleeding
- Breast tenderness
- Cramps
- Decreased libido
- Depression
- Endometriosis, fibroids, adenomyosis
- Fibrocystic breasts
- Food cravings
- Harder to reach climax
- Headaches
- Hot flashes
- Insomnia; sleep disturbances

- Mood swings
- PMS
- Water retention; bloating
- Weight gain

Prolonged use of Progesterone without adequate Estrogen

- Increases weight
- Increases total cholesterol
- Decreases HDL
- Increases LDL
- Increases triglycerides
- Causes depression
- Causes fatigue
- Decreases libido
- Increases insulin resistance

Non-Estrogen Treatment Options for Menopause Symptoms

Suffering from hot flashes and/or night sweats but do not want to take estrogen?

- Nutrition
    - To decrease estrogen
        - Fiber – reduces Estradiol
        - Vegetarian diet
            - increases fecal excretion of estrogens
            - Reduces blood levels of estrogens (up to 40%) and testosterone
    - To increase estrogen
        - Meat, fish, poultry
        - High protein and high fat (saturated)
        - Alcohol
    - Soy

      The results of the research on soy are inconclusive and contradictory. Some studies have found that soy has a positive effect on hot flashes, whereas others suggest that there isn't any beneficial effect. Christiane Northup, MD, in her book The Wisdom of Menopause, cites research that indicates that women who ate 60 grams of soy protein per day in the form of a powdered drink mix had a 45% reduction in hot flashes after 12 weeks. The following servings contain about 35-50 mg of soy isoflavones: one cup soy milk, 1/2 cup tofu, 1/2 Tempeh, 1/2 cup green soybeans (edamame), and three handfuls of roasted soy nuts.
    - Sip cool drinks
    - Avoid
        - Carbohydrates, especially high glycemic
        - Coffee
        - Spicy foods

- Exercise
  Research shows that exercise alone can alleviate hot flashes. In one study, aerobic exercise reduced the severity of hot flashes in 55% of postmenopausal women. For many women choosing not to take HRT, regular weight-bearing exercise and strength training can also help maintain strong bones. Miriam Nelson, PhD, author of Strong Women Stay Young, has done extensive research at Tufts University on the benefits of weight training. Nelson compared two groups of healthy postmenopausal women who were sedentary at the start of the program. One group lifted weights for forty minutes twice a week; the other group remained sedentary. The sedentary control group lost about two percent of their bone density during the year, while the strength-training women gained one percent in bone density. Another study of menopausal women found a 3.5% increase in lumbar spine bone mineral density among women who exercised, compared to a 2.7% decrease in the group of women who didn't exercise. It is important to avoid excessive exercise, however.
- Lifestyle
  - Wear layered cotton clothing
  - Avoid stress
  - Use ice packs
  - Relaxation and deep, abdominal breathing (6-8 breaths per minute) have been shown to reduce hot flashes by about 40% when practiced as minimally as twice per day
  - Eliminate hot baths or showers before bedtime.
- Nutritional Supplementation
  - Vitamin E (Natural, mixed tocopherols)
    Some women experience a reduction in hot flashes when taking Vitamin E. However, a placebo-controlled, randomized study evaluated vitamin E supplements (800 IU/day for four weeks) for 120 breast cancer survivors with hot flashes and found that vitamin E only marginally decreased hot flashes.
  - Folic acid
  - Boron
  - Pregnenolone
  - Vitamin b6
  - B vitamin complex
  - Chromium
- Hormones
  - Natural progesterone cream
    A study published in the journal Obstetrics and Gynecology in 1999 found that natural progesterone cream significantly reduced hot flashes compared to the placebo group. In The Wisdom of Menopause, Northrup says that a 2% progesterone skin cream works in about 85% of peri-menopausal women. As little as 1/4 tsp once per day can ease hot flashes. Make sure that you read the labels of natural progesterone cream products careful as there is great variability of progesterone content. Some creams contain less than 5 mg progesterone per ounce, whereas

others contain more than 400 mg progesterone per ounce. This can be obtained over the counter or by prescription.

- Herbs
  An isoflavone or plant estrogen derived from red clover, Promensil, was found to significantly reduce the number and intensity of hot flashes in a study conducted in 1998-99. However, an article by Adriane Fugh-Berman, MD (The (National Health) Network News, July/August 2002) states those trials of red clover were not effective over placebo for hot flash reduction.

  Probably the most common herbal remedy for hot flashes is black cohosh. However, the results of trails have been mixed. Side effects are rare but may include gastric discomfort, nausea, and vomiting. It can, however, lower blood pressure. The general recommendation is to use black cohosh for up to six months continuously. One study using mice suggested that using black cohosh, with undiagnosed breast cancer, could increase the risk for making the cancer more likely to spread.

  Dong quai acts like an estrogen and can ease hot flashes for some women. However, Lila Nachtigall, MD, in her book Estrogen states that it is not recommended because it contains psoralen, a known carcinogen.
- Acupuncture and Yoga
  The benefits of acupuncture and yoga for menopause symptoms haven't been carefully studied. Many women, however, say they help. One Swedish study found that women who had acupuncture experienced relief from hot flashes. The benefits lasted several months. Also, women are increasingly turning to yoga to alleviate menopause symptoms.

Bioidentical Estrogen and Progesterone Replenishment

When dealing with female sex hormones, the balance amongst them often is more important than the actual levels. This is true of the ratio of estrogen to progesterone, as well as estrogen to testosterone. In females, a higher ratio of testosterone to estrogen is indicative of an increased risk of heart disease (the opposite is true in males). In females, as the progesterone to estrogen ratio decreases, it creates estrogen dominance and subsequently an increased risk of breast cancer. Estrogen and progesterone act in tandem to control cell growth for normal function.

Estrogens do many things, including increasing cell proliferation, improving neural connections in the brain, and controlling insulin levels. As total estrogen levels decrease, insulin resistance and insulin levels begin to rise. Progesterone decreases the number of receptor sites for both hormones, decreases insulin resistance and promotes new bone growth (estrogen only slows bone loss). Studies show that estrogen alone causes tissue growth in the uterus that can lead to cancer; however, when replaced in conjunction with natural progesterone, the risk is reduced or eliminated.

Bio-identical estrogens have the same molecular structure as the estrogens found in the human female. These natural plant estrogens are altered so that they have the same bio-identical structure as the estrogens found in human females. Unlike many FDA-approved estrogen medications, natural bio-identical soy-derived estrogens are safe, effective and may have benefits that include:

- Cancer prevention
- Protection against osteoporosis by inhibiting osteoclasts, thus slowing bone loss. Estrogen also enhances bone mineral density by renal activation of vitamin D and intestinal absorption of calcium
- Inhibiting atherosclerosis
- Inhibiting the free radical damage caused by LDL cholesterol
- Kidney function protection
- Gallbladder protection (decreases chance of gallstones)

Combining the benefits of bio-identical estrogen and progesterone replacement provide many of the benefits without the risks. Together they can improve or prevent osteoporosis, improve mood and mental status, improve sexual function or libido. Estrogen and Progesterone can be administered by several different methods:

1. Progesterone alone (cycle or continuous)
2. Continuous estrogen plus continuous progesterone
3. Continuous estrogen plus cyclic progesterone
4. Cyclic estrogen plus cyclic progesterone

Risks Associated with Estrogen Replacement

Risks associated with estrogen replacement may include

- Increased body fat
- Increased fluid retention
- Depression and headaches
- Impaired glucose tolerance
- Increased risk of uterine cancer
- Gallbladder disease
- Aggravation of migraines, due to fluid retention

Nutritional Support

While the evidence suggests that estrogen does not cause breast cancer, when prescribing estrogen, a concurrent program of optimum nutrition and nutritional supplementation is advised to minimize breast cancer risks. Cruciferous vegetables and soy foods should be a routing part of everyone's diet, along with regular exercise – all of which reduce the risk of breast cancer (and prostate cancer in men). Among other protective nutrients such as anti-oxidants, cruciferous vegetables contain a molecule called Indole-3-Carbinol (IC3). IC3 alters the ratio of estrogen metabolites from those known to increase breast cancer risk to benign metabolites. It is difficult to consume enough cruciferous vegetables to achieve optimal protective benefit from Indole-3-Carbinol, so supplementing daily with IC3, or one of its metabolites, DIM, is a wise idea.

Estrogen Replacement Therapy (ERT)

There are no absolute contraindications for progesterone replacement, however estrogen replacement is not recommended for patients with the following conditions:

- History of breast/uterine cancer
- History of phlebitis and blood clots
- History of gall bladder diseases
- Presence of uterine fibroma
- Presence of liver disease

Side Effects of ERT

Side effects associated with natural bioidentical estrogen replacement therapy may include

- Fluid retention
- Increased body fat
- Increased risk of uterine cancer if not given in conjunction with natural bio-identical progesterone

Side effects associated with FDA-approved synthetic estrogen and progestin drugs may include

- Heart attacks
- Blood clot formation
- Weight gain
- Gallstones
- Headaches
- Fibroid tumors
- Irritability
- Fluid retention.

Signs of Excess Estrogen

- Full, painful breasts or breast growth (not applicable to women with breast implants)
- Fibrocystic breasts
- Swelling and edema (e.g., difficulty removing rings)
- Weight gain
- Irritable and uptight, but mind is clear
- Headaches
- Heavy or irregular periods

If these symptoms occur, decrease the dosage of your estrogen slightly and notify the doctor

Signs of Insufficient Estrogen

- Difficulty falling asleep, restless nights
- Awaken drenched in perspiration
- Minimum hot flashes
- Mind is foggy in the morning

- Feeling down, not in good control of mood
- Confused
- Don't care how you look

If these symptoms occur, increase the dosage of your estrogen slightly and notify the doctor

Progesterone Replacement

For women who don't want to take estrogen and just want progesterone

- Progesterone provides balance against estrogen and every woman in menopause has some degree of unopposed estrogen. Unopposed estrogen can increase the risk of breast and uterine cancer.
- Be aware that estrogen maintains the cellular receptor sites for progesterone. Progesterone alone could block some of this estrogen function. That could actually inhibit some of the ability of progesterone to perform its job

Prometrium (capsules) and Crinone (vaginal cream) are two natural products made by pharmaceutical companies. Progesterone is also available through a compounding pharmacy. Sublingual triturates absorb very well. When taking progesterone in a capsule, the liver deactivates most of it. The deactivated progesterone creates a pool of metabolites with a slight sedative-like effect. Vaginal gels are excellent for concentrating progesterone in the uterus and protecting the endometrium.

Progesterone levels are best maintained when it is administered twice daily. When taken as a once daily dose, it is recommended that it be taken at bedtime. For maximum absorption, capsules should be taken during a meal containing some form of fat. Topically applied progesterone usually requires 2-4 weeks to build up sufficient levels in the body to cause noticeable effects.

Stages of Menopause and Conditions Treated with HRT

- Pre- and peri-menopause
- Menopause
- Post-menopause
- Sleep and anxiety
- Damaged ovaries by chemotherapy
- Urogenital atrophy
- Stress incontinence
- Vaginal atrophy
- Recurrent urinary tract infections
- Premenstrual syndrome
- Menstrual migraines
- Libido enhancement
- Arousal disorder

Signs of Excess Progesterone
Signs of excess usually occur very soon after taking progesterone. In mild cases, symptoms do not last more than a few hours, but can last up to eight hours.

- Mild
    - Nipple tenderness
    - Drowsiness
    - Slight dizziness
    - Sense of physical instability
- Severe
    - Feeling of being drunk or spinning
    - Heaviness of the extremities
- Paradoxical (uncommon)
    - Feel antsy, anxious, can't sleep, retain water
    - Hot flashes or depression
    - Appetite increases and weight gain

If any of these symptoms do occur just back off the dosage of progesterone and notify the doctor

In menopause, a woman's body barely makes any progesterone. However, it is still producing some estrogen. Therefore, a situation of estrogen dominance usually exists. It is not highly unusual to have some bleeding initially when beginning progesterone. This results from previous endometrial hyperstimulation from unopposed estrogen. Some women experience unpredictable cycles of heavy, slight, or no bleeding. When this occurs it may be indicating that her estrogen level is still fluctuating. However, most breakthrough bleeding that occurs is usually worse during the first few months of progesterone use and relates more to changes occurring in the endometrium than to fluctuating endogenous hormones.

Any bleeding that develops with the use of progesterone will usually cease within 3 months. You have a few options to address this, although regular periods are certainly not harmful. If the bleeding continues beyond 10 days, contact your doctor.

Menopause is defined as the cessation of the menstrual cycle for at least 12 months. Following the cessation of ovulation, progesterone administration and/or having a period will not induce ovulation. In other words, bleeding does not mean that a woman will become pregnant. Progesterone inhibits the release of FSH, the pituitary hormone that stimulates ovulation.

Monitoring

- Pelvic ultrasound annually or whenever there is an episode of vaginal bleeding: The doctor will uterine endometrial thickness, with optimal being 5 mm or less
- Laboratory
    - Your doctor will monitor your blood work at standard times to assure your obtain optimal and safe levels of your hormones. Generally, the optimal time for having the blood drawn is approximately 4-5 hours after your morning dose of hormones

Some patients will find it difficult to precisely measure the prescribed dose of cream-based formulation, depending on how the pharmacist packages it. For example, plungers and syringes are often used to dispense from tubes. Here is a tip to help you ensure that you are using the correct amount of cream-based hormones. Write on the container the date it is opened. When the container is empty you can determine how many days it lasted. If it matches what was expected by the dose instructions, it validates to you were using the correct dose. If a large discrepancy is noted, you should notify your doctor and make adjustments in the how you dispense the cream from the container.

Human Growth Hormone (HGH)

Of all the interventions that anti-aging medicine has brought to patients who wish to slow the aging process, human growth hormone (HGH) is arguably the most profound and the most controversial. Human growth hormone, also known as somatotropin, is the most abundant hormone made by the pituitary gland in the brain. Cells in the pituitary, known as somatotropes, produce HGH and release it into the bloodstream, where it can have a direct effect by itself on tissues and organs, or it can be absorbed by the liver and converted into various other growth factors. HGH is released in pulses throughout the day, determined in large part by "circadian rhythms." Most HGH release occurs during stages III and IV deep sleep.

Two hormones, GHRH and somatostatin, produced in the hypothalamus regulate HGH production through a feedback loop. Growth hormone-releasing hormone (GHRH) stimulates HGH production and somatostatin inhibits HGH production. Specific gastrointestinal cells produce third regulating hormone, grehlin, which works in synergy with GHRH to stimulate HGH production.

Human Growth Hormone obtained its name from the fact that HGH is necessary to make children grow in stature. At one time, this was believed to be essentially the only role played by HGH. We now know differently. It appears that nearly every organ in the body depends on HGH for proper growth and development. Growth hormone increases anabolic activity and lean body mass. It regulates the body's metabolism of proteins, electrolytes, carbohydrates, and controls how the body uses fat.

The muscle building actions of growth hormone don’t come from growth hormone directly, but are mediated by conversion and release from the liver of a more potent and active form, called insulin-like growth factor 1 (IGF-1). HGH also causes the body to produce binding proteins that carry IGF-1 and act as hormones in their own right. The pituitary gland secretes growth hormone in brief spurts, and disappears from the blood very rapidly, making direct measurement next to impossible. Instead, IGF-1 levels do not fluctuate as rapidly, making it a surrogate marker of HGH levels.

HGH has been called a master hormone because of its ability to affect all the other hormones and organs throughout the body. It has repairing and restorative ability that can reverse damage, and facilitate re-growth of failing organs somewhat, something no other hormone can do. It is unclear, however, whether maintaining physiologic levels of HGH or IGF-1 equivalent to those of a 25-35 year-old person will extend the length of human life. But it is worth noting that the Journal of Clinical Endocrinology and Metabolism reported in 1997 that healthy centenarians have high serum IGF-1 concentrations.

HGH levels decline with age. After the age of 25, levels begin to decline at a rate of 10 – 15% per decade. As the levels of growth hormone decrease with age, so do the levels of IGF-1, falling by nearly 50% after the age of 40. The decline in HGH is known

as somatopause. Every hormone has a 'pause' and human growth hormone is no different.

Aging results in less (deep) sleep, diminishing opportunities for HGH secretion. Unfortunately, sleeping pills and the over-the-counter sleeping pills do not increase the length of stage III and IV sleep cycles, when HGH is secreted. Other factors can interfere with HGH secretion, including a sedentary lifestyle, other hormonal imbalances, chronic stress, and even extreme changes in diet.

Adult Growth Hormone Deficiency
Signs and symptoms associated with Adult Growth Hormone Deficiency (AGHD) include:

- Decreased
    - Memory, mood, and well-being
    - Quality sleep
    - Muscle mass
    - Lung function
    - Strength and exercise capacity
    - Bone density
    - Immune function
    - Heart function with less cardiac output
    - Joint cartilage mobility and increased arthritis
    - Skin thickness
    - Rate of wound healing
    - Glucose stability
    - Nitric oxide levels
    - thermoregulation
- Increased
    - LDL cholesterol
    - Insulin resistance
    - Body fat and central adiposity
    - C-reactive protein and other inflammatory markers
    - Fibrinogen and plasminogen activator inhibitor-1
    - Premature atherosclerosis
    - Tone in the sympathetic nervous system
    - Depression

AGHD has been described as a model for aging, because the symptoms are essentially the same associated with aging. "Normal aging" results, in part, from an insufficiency of growth hormone, as opposed to a true deficiency. The HGH levels of a normal 50 or 60 year old may be as low as those found in an adult with a pathological deficiency from pituitary disease. Less than one-third of the older population is growth hormone deficient and may benefit from replacement therapy. HGH replacement therapy can treat or reverse many of the signs and symptoms in patients diagnosed with Adult Growth Hormone Deficiency.

Excess Growth Hormone

Excess growth hormone secretion causes a condition known as acromegaly, and is associated with an increase in soft tissues, edema and joint pain. Supraphysiologic growth hormone levels also decrease apoptosis, the protective process of finding abnormally growing cells or early tumors. Since high levels of growth hormone can inhibit apoptosis and because it is an anabolic hormone which makes tissues grow (including cancer cells, potentially), questions have been raised about HGH replacement therapy as a cause of cancer. Individuals with acromegaly have supra-physiologic levels of HGH, and they have an increased risk for colon cancer. However, acromegaly confers an all-cancer risk of just 0.76.

The New England Journal of Medicine, October 1999, concluded, "There is no evidence that HGH replacement therapy affects the risk of cancer or cardiovascular disease." Much higher-than-normal levels of HGH in conjunction with low levels of another protein known as IGF-1-BP-3 (IGF binding proteins) may have a role in cancer risk development (prostate, breast and colo-rectal), according to the Lancet, April 2004.

IGF-1-BP-3 appears to have an inhibitory effect on cell growth, helping protect one from cancer by promoting programmed cell death, called apoptosis. IGFBP-3 inhibits mitogenesis by sequestering IGF-1 from the type 1 IGF receptor. It also modulates retinoid receptors, interacts with TGF-beta, and blocks cell division at G2/M. The journal Cancer reported in 2005 that "IGF-1 was not associated positively with the risk of prostate carcinoma; however an increase in the IGFBP-3 level was associated with a modest decrease." Appropriate HGH replacement therapy tends to produce a greater rise in IGF-BP3 then IGF-1. Close monitoring of IGF-1 and IGF-BP3 levels during replacement therapy is essential to avoid exceeding optimal and physiologic ranges.

Abnormally high levels of growth hormone are also associated with increased production of various inflammatory agents such as leukotrienes and cytokines. Any overproduction of inflammatory compounds resulting in an imbalance of the ratio of inflammatory to anti-inflammatory compounds causes silent inflammation, which is at the root of most aging-related diseases. Therefore, any HGH replacement program must avoid causing supraphysiologic growth hormone levels and should be balanced with other lifestyle interventions known to prevent and treat silent inflammation.

"Insulin-Like Growth Factor-1 is a Vascular Protective Factor," an article published in a 2004 issue of the American Heart Association journal, Circulation is one of many shedding light on the importance of maintaining optimal levels of growth hormone and other hormones for keeping our physiology functioning at its highest level. The following quote, from the first paragraph, of the article states the message clearly: "Recent advancements in cardiology have focused on proliferation and regeneration as a potential cardiovascular defense mechanism. Within this framework, growth factors are acquiring increasing importance; insulin-like growth factor-1 (IGF-1) emerges among them for its versatile pleiotropic actions." The authors concluded with the following statements:

- "Increasing evidence indicates…that IGF-1 protects against endothelial dysfunction, atherosclerotic plaque development, the metabolic syndrome, clinical instability, and ischemic myocardial damage."
- "Measurement of circulating IGF-1 may add valuable information to the current assessment of cardiovascular risk. Individuals with traditional cardiovascular risk factors but normal or elevated IGF-1 may be protected, at least in part, against disease. With reduced IGF-1 levels, instead, vascular risk factors may fully exert their detrimental effects, through unopposed endothelial dysfunction, endothelial apoptosis, and development of unstable plaques. Those with markedly reduced IGF-1 might develop disease even in the absence of traditional risk factors. It is worth noting that healthy centenarians have high serum IGF-1 concentrations."

HGH replacement therapy has been show to increase bone density by up to 6% over three years.

Initial HGH Corrective Measures

Improvements in growth hormone levels generally can be accomplished through a balanced approach to diet, exercise, stress management and optimization of other hormone levels. It may require significant efforts in all the following ways for 6 months or more before noting improvement in IGF-1 levels and symptoms of somatopause

- Mediterranean-type, calorie-restricted (reduced as much as 10-25%), low glycemic diet
- Lose excessive body fat
- Regular, vigorous exercise, especially weight training
- Effective stress management skills
- Correct other hormone insufficiency (e.g., thyroid, DHEA, estrogen, progesterone, testosterone)
- Omega-3 (fish oil), anti-inflammatory and anti-oxidant supplements
- Modest increases in growth hormone levels (rarely by more than 20%) can be accomplished in some patients with oral precursors for HGH (called Secretagogues). If you chooses to try this approach, ask your doctor for appropriate doses of the following secretagogues
    - Arginine
    - Ornithine
    - Glutamine
    - TMG-Betaine
    - Linoleic acid (Conjugated FA)

Contraindications to HGH Replacement Therapy

- Any evidence of neoplastic activity
- Intracranial lesions must be inactive and antitumor therapy complete prior to institution of therapy
- Intracranial hypertension
- Proliferative diabetic retinopathy
- Pulmonary fibrosis

- Recent coronary angioplasty
- HGH should be discontinued if there is evidence of tumor growth
- It should not be initiated to treat acute critical illness due to complications following open heart or abdominal surgery, multiple accidental traumas, or if you are experiencing acute respiratory failure
- Caution is required when HGH is administered to patients with diabetes mellitus, as insulin dosage may need to be adjusted.

HGH Replacement Therapy

HGH replacement therapy is never a first-line therapy for aging-related problems. Growth hormone replacement therapy is not indicated for “anti-aging” purposes. Low growth hormone levels must first be addressed with proper nutrition, nutritional supplementation, exercise, appropriate replacement of other hormones, and stress management. Growth hormone replacement therapy is limited to treating Adult Growth Hormone Deficiency, a diagnosis made after careful review of the clinical picture, a complete medical history, thorough physical examination, and review of laboratory findings that are consistent with a diagnosis of AGHD. It should be used with moderation and appropriate laboratory monitoring (see below).

HGH Replacement Therapy

HGH is a relatively large molecule, which is one reason why it cannot be taken by mouth or absorbed topically. The only current effective route for HGH is by injection. HGH is released in pulses throughout the day, determined in large by "circadian rhythms." Most HGH release occurs during deep sleep, which is known as stage III and IV sleep.

Even though most studies on HGH replacement therapy have shown decreased insulin resistance with HGH, there can be an increase in insulin resistance in some individuals. This situation usually can be prevented by decreasing the dose of HGH or by following a hormonally balanced diet as described in this manual. In men, when testosterone is used along with HGH, the complications of increased insulin resistance are frequently avoided. At any rate, close monitoring for these possible side effects is essential, with HGH dosages adjusted accordingly. Intracranial hypertension with papilledema, visual changes, headache, nausea and/or vomiting has been reported in a small number of patients treated with HGH.

Side Effects of HGH Replacement

- Intracranial hypertension with papilledema, visual changes, headache, nausea and/or vomiting has been reported in a small number of patients treated with HGH.
- Edema (swelling) of the hands and ankles. Excess doses usually result in fluid retention in the hands and feet. If this develops, discontinue the HGH until the fluid disappears (possibly 2-5 days), and call the doctor. Check blood pressure any time fluid retention develops to be sure blood pressure is not increasing as well. Continued fluid retention may lead to headaches and/or joint pain, and possibly carpal tunnel syndrome, increased blood pressure or insulin resistance.

- Parethesias (numbness and tingling in the hands)
- Arthralgias (joint aching)
- Slight bruising at the injection site
- Glucose intolerance, hyperglycemia, and/or increases serum insulin levels, at least initially. In several studies, HGH therapy resulted in small increases in fasting glucose, fasting insulin levels, and HgbA1c levels. Even though most studies on HGH replacement therapy have shown decreased insulin resistance with HGH, there can be an increase in insulin resistance in some individuals. This situation usually can be prevented by decreasing the dose of HGH or by following a properly balanced diet, low in high-glycemic carbohydrates. In men, when testosterone is administered in patients receiving HGH, the complications of increased insulin resistance are frequently avoided. At any rate, close monitoring for these possible side effects is warranted, and HGH doses are adjusted accordingly.
- In the past, HGH was extracted from the pituitary glands of human cadavers, raising the concern for possible spread of Creutzfeldt-Jakob (Mad Cow) disease. For this reason, recipients of human cadaver-derived HGH are not permitted to donate blood. Today, HGH is manufactured using the recombinant DNA technique, the same technique used to manufacture human insulin. There is no danger of Creutzfeldt-Jakob (Mad Cow) disease from modern recombinant HGH.

Monitoring

Careful monitoring is essential with HGH replacement therapy, which may include:

- IGF-1 levels, fasting glucose, fasting insulin and hemoglobin A1C are measured 4-8 weeks after initial replacement and are repeated every 2-6 months thereafter
- PSA is measured every 6 months in men
- Other hormone levels are monitored, as well as other blood tests appropriate for treatment
- Physical assessment for side effects are assessed 4-8 weeks after initial replacement and are repeated every 2-6 months thereafter
- Annually
    - Physical examination
    - Baseline blood testing
    - Women are required to have annual pap smears and mammograms
    - All patients are urged to have a colonoscopy every 3 years over age 50

NOTES

Optimal Nutritional Supplementation for Living Younger

"God gives every bird its food, but He doesn't throw it in the nest" – J.G. Holland

Micronutrients (vitamins, minerals and other agents such as anti-oxidants) are essential for life but in lesser quantities than macronutrients. Vitamins and minerals act as coenzymes which are at the heart of every bodily and neural function. Numerous enzyme processes are dependent on micronutrients. Many nutrients act as antioxidants, controlling the free-radical activity that wears our bodies down. Moreover, gene expression, both protective and harmful, is impacted by micronutrients. Recent studies show that vitamins and minerals also help control chronic inflammation, now believed to be at the root of aging, degeneration, and dozens of diseases.

The bulk of your micronutrients should come from the food you eat. Taking nutritional supplements as though they are nutritional replacements for real food and a balanced diet is a mistake. A healthful diet is necessary for many nutritional supplements to even provide any benefit to you. If you are eating an optimum, nutritionally balanced diet you will be getting most of the essential vitamins, minerals, and other nutrients you require for optimal health. It is possible, however, that you may not be ingesting sufficient quantities. The government published recommended daily allowances (RDA) for vitamins and other supplements are just enough to keep you alive. The RDA's are not enough to prevent the degenerative changes associated with aging. To acquire micronutrients in quantities sufficient to prevent aging-related disease and dysfunction it is likely that you will need a source in addition to your food.

Where Our Diets Fall Short

A surprising number of Americans fail to get even the recommended daily allowances (RDA) for a host of basic vitamins and minerals, according to U.S. Department of Agriculture surveys:

Nutrient	% Not Getting RDA	Importance
Zinc	73	Supports the immune system, wound healing, hormone levels, growth, and development
Calcium	65	Maintains bones, helps control blood pressure
Magnesium	62	Helps control blood sugar and blood pressure; may help prevent diabetes and heart disease
Vitamin A	56	Helps maintain immune system, protects against oxidation; may reduce risk of certain cancers
Vitamin B6	54	Helps maintain the immune system and controls blood sugar and level of homocysteine
Vitamin C	38	Necessary for tissue repair and growth; may help reduce risk of cancer and stroke
Folic acid	33	Promotes normal growth and development; helps produce cells and protect DNA; helps control homocysteine level

Do the Prescriptions You Take Deplete Your Nutritional Status?
Many of the most commonly used medications further complicate the challenge to get optimum nutrient levels. Even if you consume sufficient quantities of nutrients, some medications prevent them from being absorbed or effectively used. Other medications can reduce the bodies' production of nutrients. The following table lists several classes of common medication with the associated nutrients that can be depleted.

Type of Drug	Name Brand Examples	Nutrients Depleted
Antacids	Pepcid, Tagamet, Zantac	Vitamin B12, Riboflavin, Folic Acid, Vitamin D, Calcium, Copper, Iron, Zinc
	Prevacid, Prilosec	Vitamin B12
Antibiotics	General Aminoglycosides (gentomycin, neomycin, streptomycin), Cephalosporins, Penicillins	B vitamins, Vitamin K, Friendly beneficial intestinal bacteria
	Tetracyclines	Calcium, Zinc, Magnesium, Iron, Vitamin B6
Anti-Diabetic Drugs	Dymelor, Micronase, Tolinase	Coenzyme Q10
	Glucophage	Coenzyme Q10, Vitamin B12, Folic acid
Antidepressants	Adapin, Aventyl, Elavil, Tofranil, Pamelor, Sinequan, Norpramin	Vitamin B12, Coenzyme Q10
Anti-Inflammatories	Aspirin & Salicylates	Vitamin C, Folic Acid, Iron, Potassium
	Advil, Aleve, Anaprox, Dolobid, Feldene, Lodine, Motrin, Naproxyn, Orudis, Relafen	Folic Acid
	Betamethasone, Cortisone, Dexemethasone, Hydrocortisone, Methylpredinisolone, Predisone	Vitamin C, D, Folic Acid, Calcium Magnesium, Potassium, Selenium, Zinc
Cardiovascular Drugs	Apresoline	Vitamin B6, Coenzyme Q10
	Catapres, Aldomet	Coenzyme Q10
	Corgard, Inderal, Lopresor, Betapac, Tenormin, Sectral, Blocadren	Coenzyme Q10, Melatonin
	ACE inhibitors	Zinc
Diuretics	Lasix, Bumex, Edecrin	Vitamins B1, B6, Folic acid, C, Magnesium, Calcium, Potassium, Zinc, Sodium
	Enduron, Diuril, Lozol, Zaroxolyn, Hygroton	Magnesium, Potassium, Zinc, Coenzyme Q10, Sodium
Cholesterol Lowering Agents	Lescol, Lipitor, Mevacor, Zocor, Pravacol	Coenzyme Q10
	Colestid, Questran	Vitamins A, B12, D, E, K, Beta-Carotene, Folic Acid, Iron
Ulcer Medications	Tagamet, Pepcid, Axid, Zantac	Vitamins B12, D, Folic Acid, Calcium,

Type of Drug	Name Brand Examples	Nutrients Depleted
		Iron, Zinc, Protein
	Prevacid, Prilosec	Vitamin B12, Protein
Synthetic Hormone Replacement Therapy	Evista, Prempro, Premarin, Estratab	Vitamins B2, B6, B12, C, Folic Acid, Magnesium, Zinc
Oral Contraceptives	Orinyl, Ortho-Novum, Triphasil, etc.	Vitamins B2, B3, B6, B12, C, Folic Acid, Magnesium, Selenium, Zinc

Should You Take Supplements?

In addition to the fact that many Americans do not consume adequate amounts of many micronutrients and that micronutrient absorption is adversely affected by numerous common medications, there are, in fact, several additional reasons to consider supplementation even when consuming a healthful diet and not taking medications:

1. Many of today's foods are not as rich as they once were in vitamins and minerals by the time you consume them. Soils are depleted in many areas due to some farming methods. In many areas, too, soils are damaged from exposure to toxins, pesticides, herbicides, and fertilizers. The heavy use of pesticides and herbicides adds risks from ingesting toxins.

   Findings published in a 2004 issue of the Journal of the American college of Nutrition showed diminishing levels of nutrients in fruits and vegetables. Much of it has to do with the way commercial growers do business. Selective breeding for water and pith (the fibrous part of fruits and vegetables) has created produce that is ships well and weighs a lot. The downside is less vitamin content. Many of the newer hybrids are as much as 50% lower in nutrients. Many foods are harvested before the food has ripened fully, to avoid spoilage before arriving at the market. Green fruit doesn't have a chance to sun-ripen; it is artificially ripened with ethylene. Produce deprived of sunlight cannot develop sunlight-related nutrients such anthocyanins. Anthocyanins provide humans with protection against cancer, DNA damage, brain cell deterioration, and much more. Polyphenols likewise have no chance to fully develop when produce is picked green. By some estimates as much as 50% of the antioxidants found in produce form only during the final 20% of maturation to a fully ripened state. Harvesting produce before it is fully ripe robs us of the full potential nutritional value. The traditional Mediterranean nutritional lifestyle involves purchasing produce at the market daily, when it is at its peak, maximizing the nutrient content.

   Packaging and preservation methods, shipping delays, variations in shipping/storage temperatures and humidity can further deplete foods of their nutritional value.
2. The American lifestyle does not promote healthful nutrition habits. We live busy lives, and most of us find it difficult to eat a perfect diet every day, including 8-10 servings of fruits and vegetables, healthy fats, whole grains and minimal sugar.
3. Through epidemiological studies of populations, we know that the eating habits and kinds of foods eaten in various cultures contribute to a lower incidence of

various diseases and even result in improved longevity. For example, the Okinawan people are among the longest-lived people known. Much of their longevity has been attributed to their diet. Prostate and breast cancer rates are significantly lower in Asian cultures where soy makes up a large part of the diet. Yet it would be unrealistic to assume most Americans could fully adopt their eating habits. An alternative is to augment our diet with specific nutritional supplements found in the foods consumed by various cultures and have also been shown to contribute to reduced disease, better health or longevity.

4. Scientific research has found that many micronutrients, when consumed in sufficient quantity can provide significant protection from disease. The problem is that the quantities demonstrated by research to provide significant health benefits may be difficult or impossible to attain by using food as the sole source. Indole-3-Carbinol (I3C), for example, may reduce the risk of breast cancer when ingested in adequate quantity. I3C is naturally present in cruciferous vegetables. However, one would have to consume several pounds of cruciferous vegetables daily to reach protective levels. While consuming cruciferous vegetables as often as possible is desirable, augmenting your diet with targeted nutritional supplements such as IC3 may offer adequate protection.
5. As we age our digestive system loses the capability to adequately absorb many nutrients, even when the diet is otherwise optimally-balanced. Deficiencies are common as a result. Nutritional supplementation is a reasonable solution.
6. Many prescription and over-the-counter medications interfere with absorption of some nutrients from our food or with their production by our body.

Let's take a closer look at two important micronutrients

Evidence suggests that many nutrients are better absorbed and more effectively used when taken in their natural form as opposed to a synthetic version, particularly vitamin E and beta-carotene. Studies show that the synthetic forms of fat-soluble vitamins such as vitamin E and beta-carotene may actually interfere with the absorption of the natural forms. Vitamin E supplements should contain a mixture of tocopherols and tocotrienols not just alpha-tocopherols. Mixed carotenes are preferable to just beta-carotene. The human body requires all the major tocopherols for greatest health benefit – alpha, beta, delta, and gamma.

A published report from Johns Hopkins in 2005, suggested that vitamin E supplementation might do more harm than good. The report was not based upon original research, but used data from several previous studies. This is called a meta-analysis. The authors rejected many studies that found benefits from the supplementation of vitamin E. Furthermore, the report looked at all-cause mortality, meaning that if someone died of any cause during the study, even if the death occurred for reasons unrelated to the use of vitamin E, the death was still included in the report. The report essentially looked at studies using dl-alpha tocopherol. Most vitamin E supplements contain only the alpha tocopherol, and exclude the others (beta, delta, and gamma).

Studies have shown that supplementing with high quantities of alpha tocopherol alone can actually result in a deficiency of gamma tocopherol, perhaps the most important of the tocopherols. While alpha tocopherol inhibits free-radical production, gamma tocopherol is required to trap and neutralize existing free radicals. Gamma tocopherol (not the alpha form) quenches peroxynitrite, the free radical that plays a major role in the development of age-related decline. Other studies suggest that the synthetic form of alpha tocopherol, which is the formulation most often used in vitamin E supplements, is not as beneficial as the natural form. To tell the difference between the synthetic and the natural form of alpha tocopherol, if the ingredient label lists dl-alpha tocopherol it is synthetic. If the ingredient is d-alpha tocopherol, it is the natural form. The preponderance of the data suggests that supplementing with vitamin E is beneficial, when the natural forms of all four tocopherols are taken together. This means selecting only vitamin E supplements containing all four tocopherols – alpha, beta, delta, and gamma. The label will often use the words “mixed tocopherols” when it contains all four. Because vitamin E can itself oxidize, taking vitamin C along with it is essential to reactivate the antioxidant function of vitamin E.

Omega-3 – is involved with everything from inflammation to cancer, lipids to heart disease, and neurodegenerative diseases. How much do you need? Dr. Barry Sears makes a compelling argument for measuring the ratio of arachidonic acid to EPA (eicosapentaenoic acid), aiming for a ratio close to 1:1. Other useful markers would include the triglyceride to HDL cholesterol ratio. Since high sensitivity C - reactive protein (hs-CRP) is a blood marker for silent inflammation, it can also serve as a useful guide. The American College of Cardiology suggests that 1.6 grams of the essential omega-3 fatty acids EPA and DHA is safe and can significantly reduce the risk of cardiovascular disease. Other studies find that even higher doses can be effective for the management of inflammatory and neurological diseases. I generally suggest a starting dose of 2-3 grams daily for most individuals, at least until a complete hormonally balanced nutritional lifestyle has been fully integrated and the above-mentioned blood markers are reaching optimum levels. Even higher doses, of 4-6 grams daily may be required for the management of cardiovascular and neurological diseases. While fish oil has blood-thinning effects, they are generally very mild. Some estimates comparing the blood thinning capacity of fish oil with that of aspirin find that 10 grams of EPA and DHA would be needed to equal one 325 mg aspirin tablet. If you are on a blood thinner, such as coumadin, be sure to discuss this with your doctor prior to initiating or increasing the dose of fish oil. It would probably be better to use fish oil daily and possibly reduce the dose of your blood thinner medication, than to miss out on the benefit of the fish oil.

If you are a vegetarian, taking fish-oil is not an option. But there are other choices. Flaxseed oil is the most common vegetarian source of omega-3s. It contains alpha-linolenic acid (ALA), the parent molecule of EPA and DHA fatty acids. Your body should be able to convert ALA to EPA and DHA, but many people are not efficient at the process.

Typically, the ability to convert ALA to EPA and DHA declines as you get older. Trans fats interfere with the conversion. People with diabetes may be unable to convert ALA. Virus infections and certain medications will also interfere with the ability to make the conversion. Moreover, the body is not very efficient at making the conversion anyway; usually less than 15% of the ALA is converted to EPA and DHA.

To boost the conversion of ALA to EPA and DHA ensure that you are getting adequate vitamins B3, B6, and C, along with magnesium and zinc. Vegetarian foods relatively rich in ALA include spinach, dark lettuces, and arugula. Another alternative to flaxseed oil is to take DHA derived from algae.

Additional information about all the recommended nutritional supplements can be found in the Resource section of the book.

Taking Nutritional Supplements

Standardized supplements are one way of incorporating a standard amount of known nutrients in the diet. Remember, supplements are not a replacement for food, but they might offer that extra edge. It is estimated that a calcium supplement alone could keep more than 100,000 people out of the hospital and save $2.6 billion in medical expenses annually. If taken long enough, magnesium supplements could reduce by half the number of colon and rectal cancer cases in women.

When it comes to buying vitamins, begin with a full-spectrum multi-vitamin-and-mineral formula that includes most of the basics. Start with this as a foundation, and add nutrients you need to round out those on your list. Selecting pharmaceutical grade over health food grade supplements generally provides a greater degree of purity.

Unless directed otherwise, take your supplements immediately before or after a balanced meal. Do not take supplements on an empty stomach unless recommended, and be sure to include some fat so that fat-soluble vitamins (A, D, E, and K) are absorbed. Only so much can be absorbed at one time. Divide your total daily supplements into two or three separate doses throughout the day, and take them with breakfast, lunch, and/or dinner.

Studies show that regular exercise – at a minimum, a half hour of moderate aerobic exercise three times a week – helps your body use nutrients more efficiently. Yet another reason to exercise!

Are Your Supplements Safe?

Seventy percent of adults in the U.S. take some form of nutritional supplement. There are many good reasons to consider supplementing a balanced diet with nutritional supplements, as we have discussed. Nevertheless, are the supplements you take safe? Just because a nutritional supplement is “natural” does not mean it is safe for human consumption.

Sixty percent of U.S. consumers believe dietary supplements require approval by a government agency, such as the FDA. The reality is that supplements are loosely

regulated. The Dietary Supplement Health and Education Act (DSHEA) places the burden on the FDA to prove a supplement is dangerous, whereas drug manufacturers are required to prove first that a drug is reasonably safe before it can be sold.
Supplement labels do not have to disclose contraindications, drug interactions or other warnings. The adverse reaction incidence from supplements is largely unknown. Prescription medications have been listed as the fourth leading cause of death. The toll from supplements is nowhere near as great, but it is not trivial.

The lack of required or standardized safety testing of supplements makes it difficult for the consumer to know what hazards might exist when deciding whether to take a supplement. It is generally believed that adverse reactions and other problems associated with supplements are currently underreported. The availability of adverse reactions that are reported is not widely accessible. No label warnings are required for supplements. 'Buyer beware' is the consequence. Reliable sources of information about nutritional supplements can be found in the Reservoirs section of this book.

Supplements to Avoid
As mentioned, a nutritional supplement is not necessarily safe for human consumption, just because it is "natural." The following supplements have known toxic or harmful effects and should be completely avoided.

Supplements to Avoid	
Aristolochic acid (Aristolochia, snakeroot/weed)	• Ingredient found in some traditional Chinese medicines • Toxic to the kidneys and carcinogenic
Bitter Orange (Citrus aurantium, green orange)	• High blood pressure associated with use • Increased risk of heart arrhythmias, heart attack and stroke associated with use
Chaparral (Larrea divariacata, greasewood)	• Can cause hepatitis
Comfrey Symphytum officinale, black root)	• Can cause chronic and fatal liver disease
Ephedra	• Linked to high blood pressure, strokes, and heart attacks • 200 times more likely to cause an adverse reaction than all other herbs combined
Germander (Teucrium chamaedrys, wild germander)	• Abnormal liver function linked with use
Kava (Piper methysticum, long pepper)	• Suspect in liver damage that has resulted in 11 liver transplants

Supplements to Avoid	
Lobelia (Lobelia inflate, asthma weed, wild tobacco)	• Difficulty breathing and rapid heart rate associated with use
PC SPES and SPES	• Claimed to fight prostate cancer • Spiked with hormones, a blood thinner, an anti-inflammatory, and several other drugs
Pennyroyal oil (Hedeoma pulegioides, tickweed)	• Liver and kidney failure associated with use • Nerve damage, convulsions, abdominal tenderness, burning of the throat are risks • Deaths have been reported
Scullcap (Scutellaria lateriflora, pimpernel)	• Abnormal liver damage associated with use
Tiratricol	• Weight-loss supplement • Can cause strokes and heart attacks
Usnic acid	• Toxic to the liver
Yohimbe (Pausinystalia yohibe, yohimine)	• Blood pressure changes associated with use • Heart beat irregularities associated with use • Heart attacks have been reported

Supplements to Discontinue During the Peri-Operative Period

While nutritional supplements can be beneficial for a variety of conditions, their use around the time of surgery may not be desirable. Therefore, it is advisable to stop taking the products listed below to avoid potential problems during surgery and anesthesia. If time permits, discontinue the use of these products two weeks prior to surgery, and one to two weeks after surgery.

Supplements to Discontinue During the Peri-Operative Period	
Bilberry (vaccinium myrtillus)	Has anti-platelet activity & may inhibit clot formation.
Cayenne (capsicum annuum)	Overdose may cause severe hypothermia.
Dong Quai (angelica sinensis)	Active constituent is coumarin derivatives, which may potentiate existing anticoagulant medications.
Echinacea (echinacea augustfolia)	Use of echinacea may impact the liver when general anesthetic or certain other medications such as anabolic steroids or methotrexate are used.
Feverfew (tanacetum parthenium)	May increase bleeding, especially in patients taking certain anti-clotting medications.
Fish Oil Capsules	Has blood-thinning properties.
Garlic (allium sativum)	May augment effects of coumadin, warfarin and NSAIDs causing abnormal bleeding time
Ginger (zingiber officinale	Use of ginger may alter bleeding time. Ginger may interfere with cardiac and anticoagulant medications.

Supplements to Discontinue During the Peri-Operative Period		
Ginkgo Biloba (ginkgo biloba)	Anticoagulant activity is 3 times stronger than vitamin E.	
Ginseng (panax ginsengjpanax quinquelblium)	Anticoagulant that may interact with cardiac, hypo/hypertensive medications and hypoglycemic agents.	
Hawthorne (crataegus /aevigata)	Potentiates the actions of digitalis and other cardiac glycosides	
Kava Kava (piper methysticum) **[should be avoided altogether]**	May potentiate CNS effects of barbiturates, alcohol, antidepressants, antipsychotics, and general anesthetics.	
Licorice Root (glycyrrhiza glabra)	Glycyrrhizic acid in licorice may cause high blood pressure, hypokalemia and edema.	
Ma Huang (ephedra sinica) **[should be avoided altogether]**	Causes hypertension, tachycardia, cardiomyopathy, and cardiac dysrhythmias.	
Melatonin	May potentiate CNS effects of barbiturates and general anesthetics.	
Red Clover (trifolium pratense)	Active constituent include coumarin derivatives, which may potentiate existing anticoagulant medications.	
St. John's Wort (hypericum perforatum)	May have a monoamine oxidase (MAO) inhibitory effect. Can interact with MAO inhibitors and other anti-depressants. Many other drug interactions reported.	
Valerian (valeriana officinalis)	May increase effects of sedative hypnotics.	
Vitamin E	Anti-clotting benefits can prolong bleeding time.	
Yohimbe (corynanthe yohimbe)	Increases the potency of anesthetics.	
Quercitin	Quercitin inhibits the release of inflammatory mediators including histamine.	
You may be asked to discontinue the following as well		
Bioflavonoids	**Copper**	**Vitamin C**
Bromelain	**Selenium**	**Vitamin K**
B-Complex Vitamins	**Vitamin A**	**Zinc**

Nutritional Supplement Monographs

Alpha Lipoic Acid

Biochemical Effects

- Antioxidant activity; Antioxidant recycling activity
- Blocks activation of transcription factor NfkB
- Activity in enhancing biological energy production
- Water- and fat-soluble
- Helps to lower blood sugar

Indications

- May be useful in the prevention and treatment of diabetic neuropathy
- May be beneficial in preventing and treating Syndrome X, congestive heart failure and strokes
- May stabilize arrhythmias
- Inhibits protein glycation
- May help prevent the oxidation of LDL cholesterol
- Lowers total cholesterol
- May be protective, generally, against oxidative stress and, specifically, against atherosclerosis ischemia-reperfusion injury and various radiologic and chemical toxins.
- May have some immune-modulating effects.
- May slow aging of the brain and be an anti-aging substance, in general

Dietary Sources

- Liver, yeast, spinach, broccoli, potatoes, yams, and red meat

Dosage

- 250 mg twice daily with meals
- If diabetic 250 mg 3 -4 times daily

Interactions

- Those with diabetes on antidiabetic medication should have their blood glucose monitored and antidiabetic drug dose appropriately adjusted, if necessary, to avoid possible hypoglycemia

Side Effects/Toxicity

- Should be avoided in pregnant women and nursing mothers
- Those with diabetes and problems with glucose intolerance are cautioned that supplemental alpha-lipoic acid may lower blood glucose levels. Blood glucose should be monitored and antidiabetic drug does adjusted, if necessary, to avoid possibly hypoglycemia
- To date, doses up to 600 mg daily has been well tolerated.

Contraindications

- None known

Beta- Carotene

Biochemical Effect

- Enhances fertility
- Antioxidant — anticancer and anti-aging effects
- Enhances immune function — enhances thymus gland function and increases interferon's stimulatory action on the immune system, which protects against viral infections

Indication

- Prevention of cancer — specifically cancers involving epithelial tissues, (lung, skin, uterine cervix, gastrointestinal tract, etc)
- Prevention of cardiovascular disease — may inhibit damage to cholesterol and the lining of the arteries
- Enhancer of immune function
- Prevention of vaginal candidiasis
- Treatment of photosensitivity disorders
- May protect against macular degeneration

Dietary Sources

- Carrots, parsley, collard greens, peaches, apricots, cantaloupes, yams, beets, spinach, romaine lettuce

Dosage

- 25,000 IU (15mg of beta-carotene) daily for general health
- 25,000 — 300,000 IU for the treatment of pre-cancerous lesions and immune enhancement

Interactions

- Concomitant use with cholestyramine, colestipol, mineral oil, orlistat, carotenoid lutein, pectin or olestra may decrease the absorption of beta-carotene
- Administration of beta-carotene may decrease vitamin E levels unless vitamin E supplements are also given
- Increases the hepatotoxic effect of ethanol

Side Effects / Toxicity

- No reported overdose
- High doses may turn slightly yellow-orange in color
- Beta-Carotene does not have the same effect as vitamin A in the body and is not harmful in larger amounts unless your liver cannot convert beta-carotene into vitamin A

Contraindications

- Hypersensitivity to any component of a beta-carotene-containing preparation
- Pregnant women and nursing mothers should avoid intake greater than 3-6 mg daily from nutritional supplements
- Smokers should avoid beta-carotene supplements

Beta-Sitosterol

Biochemical Effects

- A phytosterol with possible activity in promoting prostate health
- Cholesterol-lowering activity
- May have some anti-inflammatory activity in the prostate
- Found in saw palmetto, pumpkin seed, and Pygeum

Indications

- Benign prostate hypertrophy (BPH)
- Possibly for high cholesterol

Dietary Sources

- Pumpkin seeds

Doses

- 60-130 mg three times daily with meals
- Maximum dose: 1500 mg daily

Interactions

- May lower serum levels of alpha- and beta-carotene, lycopene, and vitamin E, probably by interfering with their absorption

Side Effects / Toxicity

- No reports of overdoses
- May cause gastrointestinal problems, such as indigestion, gas, diarrhea, and constipation

Contraindications

- Contraindicated in those with the genetic disorders sitosterolemia and cerebrotendinotic xanthomatosis, both rare conditions

Bilberry

Biochemical Effects

- Contains powerful antioxidants known as anthocyanidins
- Supports eye health and cardiovascular health
- Astringent and has anti-diarrheal action
- May be blood vessel-protective
- May inhibit platelet aggregation in blood

- May have an anti-ulcer effect

Indications

- May be useful in the prevention and treatment of diabetes mellitus
- Nonspecific, acute diarrhea
- May be useful for vasoprotective and anti-edema properties
- May be useful for the treatment of diabetes and hyperlipidemia

Dosage

- 100 mg daily

Interactions

- There is a possibility that the herb can interact with other platelet aggregation inhibitors such as aspirin and anticoagulants like warfarin.

Side Effects/Toxicity

- No health hazards or side effects are known conjunction with the roper administration of designated therapeutic dosages digestive complaints due to the high tannin content are possible.

Contraindications

- None known

Biotin

Biochemical Effects

- A member of the B-vitamin family; an essential nutrient
- Involved in the biosynthesis of fatty acids, gluconeogenesis, energy production, the metabolism of branched-chain amino acids and the de novo synthesis of purine nucleotides
- Plays a role in gene expression and may play a role in DNA replication
- May have some antioxidant properties
- Putative glucose tolerance-modulating activity
- Even marginal biotin deficiency is teratogenic in many mammals

Indications

- Biotin-responsive inborn errors of metabolism holocarboxylase synthetase deficiency and biotinidase deficiency
- May improve disordered glucose metabolism in some cases of diabetes
- May favorably affect lipids
- Reportedly benefits some with brittle nails

Dietary Sources

- Egg yolk, liver, kidney, pancreas, sardines, milk, soy and barley
- Brewer's yeast is one of the richest sources
- Royal jelly

Dosage

- RDA 300 mcg daily
- Blood glucose management: up to 3-5 mg three times daily

Interactions

- Antibiotics: may decrease the biotin contribution to the body made by the microflora of the large intestine
- Anticonvulsants (carbamazepine, phenytoin, phenobarbital, primidone): may accelerate biotin metabolism and may cause reduced biotin status
- Pantothenic acid: high doses inhibit the absorption of biotin produced by the microflora in the large intestine

Side Effects/Toxicity

- There are no reports of adverse reactions associated with biotin supplementation

Contraindications

- Contraindicated in those hypersensitive to any component of a biotin-containing product

Boron

Biochemical Effects

- A trace mineral found mainly in plants
- May have estrogen-mimetic activity
- May have anti-osteoporosis activity
- May participate in regulating the respiratory burst of neutrophils
- Influences transport of extracellular calcium and the release of intracellular calcium in platelets activated by thrombin
- May be a metabolic regulator in several enzymatic systems
- May have antioxidant activity

Indications

- Osteoporosis prevention
- May raise testosterone levels in women

Dietary Sources

- Fruits (especially apricots) and vegetables

Dosage

- 2-10 mg daily

Interactions

- None known

Side Effects/Toxicity

- Doses up to 18 mg daily appear safe for adults
- Doses of 180 mg daily have caused diarrhea, nausea, and abdominal cramps
- No evidence boron is carcinogenic or mutagenic

Contraindications

- None known

Calcium

Biochemical Effect

- Needed for the formation of strong bones and teeth as well as for the maintenance of healthy gums.
- Prevention of bone loss associated with osteoporosis.
- Needed for muscular growth and contraction, and for the prevention of muscle cramps

Indications

- Preventing and treating osteoporosis
- Reducing the risk of colorectal cancer
- May be useful in some with hypertension (high blood pressure)
- May diminish symptoms of premenstrual tension (PMS)
- May help reduce obesity
- Leg Cramps
- May lower cholesterol

Dietary Sources

- Milk products, dark-green vegetables, nuts, grains, beans, canned salmon and sardines (if you eat the bones), tofu (set in calcium) and other calcium-fortified foods and beverages

Dosage

- 18 – 30 years of age: 1,000 mg daily with food
- 31 – 50 years of age: 1,200 mg daily with food
- Over age 50
  - Women: 1,500 mg daily with food
  - Men 51-65: 1,200 mg daily with food
  - Men over 65: 1,500 mg daily with food
- Take digestive enzymes with calcium to assist assimilation

Interactions

- Concomitant use of H2 blockers, proton pump inhibitors, inositol hexaphosphate, sodium alginate and vitamin D may reduce absorption of calcium
- Concomitant use may reduce absorption of biphosphonates, levothyroxine, quinolones, tetracyclines and iron

Adverse Reactions

- Generally well tolerated
- Calcium carbonate may cause constipation, bloating, gas and flatulence
- Prolonged use of calcium carbonate greater that 12 gm daily may lead to the milk-alkali syndrome, nephrocalcinosis and renal insufficiency
- Overdosage has not been reported

Precautions

- May increase the risk of kidney stones

Contraindications

- Hypercalcemia. Conditions causing hypercalcemia include sarcoidosis, hyperparathyroidism, hypervitaminosis D and cancer
- Hypersensitivity to any component of a calcium-containing supplement

Carnitine

Biochemical Effects

- A non-essential amino acid and it is synthesized in the liver from lysine and methionine
- Found in the highest concentrations in the adrenal glands, skeletal, and cardiac muscle
- L-carnitine functions to move long and medium chain fatty acids across the cell wall and into the mitochondria, which enables the muscle cell to utilize the fatty acids and triglycerides as a source for energy via a process known as beta oxidation; therefore, it plays a vital role in fatty acid metabolism
- L-carnitine has been shown to cause improvements in heart muscle by bringing EFAs into the interior of the cell to be burned as fuel in the mitochondria

Indications

- Its main function in the body is to help transport long-chain fatty acids, mainly in the mitochondria, to provide energy
- Increases the use of fat as an energy source. This prevents fatty buildup, especially in the heart, liver, and skeletal muscles
- It provides a benefit in heart disease by improving stress tolerance in patients with angina and improving performance of the ischemic heart; it has also been shown to prevent the occurrence of ventricular fibrillation in early ischemia; it has also shown benefits in lowering cholesterol
- It has been used to treat muscle weakness
- May be beneficial in angina, diabetes, congestive heart failure, and cardiac arrhythmias
- May be useful in the treatment of diabetes

Dietary Sources

- Meats

Dosage

- Range of 1,500 to 4,000 mg daily in divided doses
- 1.5 grams/day for noticeable changes in triglycerides and HDL levels
- 2-2.5 mg/day for athletic endurance
- For better absorption: take on an empty stomach, with vitamin B6 and Vitamin C

Interactions

- Choline
- Carnitine and CoQ10 appear to work synergistically when combined. The same is true for pantethine

Side Effects/Toxicity

- No toxicity has been shown; only side effect is a mild euphoria

Precautions /contraindications

- DL-carnitine is not recommended. The D form, the mirror image of the L form, has produced side

effects indicating that it interferes with the natural L form of carnitine
- Patients with bi-polar depression and epilepsy should avoid carnitine

Carnosine

Biochemical Effect

- Multifunctional dipeptide of amino acids beta-alanine and l-histadine
- Long-lived cells such as nerve cells (neurons) and muscle cells (myocytes) contain high levels of carnosine
- Muscle levels of Carnosine correlate with the maximum life spans of animal species
- Muscle levels decline 63% from age 10 to age 70
- Antioxidant, anti-glycating, aldehyde quenching and metal chelating actions
- Ability to rejuvenate connective tissue cells
- Enables hear muscle to contract more efficiently through enhancement of calcium response in heart myocytes
- Protects brain against Excitotoxicity, copper and zinc toxicity, protein cross-linking and glycation, and cell membrane oxidation

Indications

- Protection against protein modification and metabolism
- Surgical wound healing
- Prevent skin aging, LDL oxidation, DNA damage, neurological degeneration, muscle wasting, accumulation of damaged proteins in the body, cell aging, circulatory problems in the brain, build-up of glycation end products and cross-linking of protein in the lens of the eyes
- Inhibit amyloid plaque formation
- Buffer against too much zinc or copper in the body
- Lower cholesterol

Dietary Sources

- Red meat

Dosage

- 500 mg two-three times daily

Side Effects/Adverse Reactions

- No toxicity at doses of 500 mg/kilogram of body weight

Interactions/Contraindications

- Hypersensitivity to any component of a carnosine-containing product
- Pregnant women and nursing mothers should avoid using carnosine

Choline

Biochemical Effects

- Necessary for structure and function of all cells
- Precursor for Phosphatidylcholine biosynthesis
- Precursor for acetylcholine biosynthesis, a neurotransmitter
- Is a methyl donor

Indications

- May be helpful in some liver diseases
- May be helpful in some cognitive disorders
- May be helpful in some cancers

Dietary Sources

- Beef liver, egg yolks, and soya, iceberg lettuce, peanut butter, peanuts, cauliflower

Dosage

- 300-1200 mg daily

Interactions

- Methotrexate: may diminish pools of all choline metabolites
- Nutritional supplements: Choline works in concert with vitamins B6, B12 and folic acid in the metabolism of homocysteine

Side Effects/Toxicity

- Doses up to 3 grams are generally well tolerated
- Occasional nausea, diarrhea and loose stools. Higher doses are associated with fishy body odor
- Some reports of excessive sweating, hypotension, and depression with high doses

Contraindications/Precautions

- None known
- Those with primary genetic trimethyluria should restrict intake
- Those with liver disease caused by viral hepatitis should restrict intake

Chromium

Biochemical Effect

- Enhances the activity of insulin at the cellular level
- May have hypocholesterolemic and anti-atherogenic activities

Indication

- Diabetes mellitus
- Glucose intolerance
- May be useful for treating high lipid levels

Dietary Sources

- Vegetables, yeast

Dosage

- 400 mcg daily
- Dosage range is 200-1,000 mcg daily

Interactions

- Concomitant use with beta-blockers may elevate HDL cholesterol
- Concomitant use with ascorbate may increase absorption of chromium
- Ingestion of large amounts of refined sugar may deplete chromium

Side Effects / Toxicity

- Generally well tolerated, however, some individuals may experience lightheadedness or develop a slight skin rash

Contraindications

- Hypersensitivity to any component of a chromium-containing supplement
- Pregnant women and nursing mothers should avoid doses above 200 mcg
- Those with a history of hypoglycemia should use caution in the use of chromium supplements
- Those with a history of hyperglycemia or type 2 diabetes should only use chromium supplements for the possible management of abnormal glucose tolerance under medical supervision

Chrysin

Biochemical Effect

- May have aromatase-inhibitory action
- May have phytoestrogenic, antioxidant and anxiolytic activities

Indication

- To inhibit aromatization of androstenedione and testosterone to estrogens
- Anxiolytic
- Possible as chemo-preventive in cardiovascular disease and cancer

Dosage

- Usual dosage for aromatase-inhibition - 1 gram daily
- Maximum dose – 3 grams daily
- Absorption may be enhanced with concurrent administration of piperine 5-10 mg

Interactions

- Concomitant use with aromatase inhibitors such as aminoglutethimide, anastrozole and letrozole

may be additive

Side Effects / Toxicity

- No reported adverse reactions
- No reported over-dosage

Contraindications

- Contraindicated in those with prostate cancer
- Hypersensitivity to any component of a chrysin-containing product
- Pregnant women and nursing mothers should avoid using chrysin
- Women generally should avoid use
- Women with hormone dependent malignancies (breast, uterine, ovarian) should only use chrysin if they are in a clinical study or if chrysin is prescribed and monitored by their physician

Co-Enzyme Q-10

Biochemical Effect

- An antioxidant that is structurally similar to vitamin E
- Reduces oxidized vitamin E
- It plays a crucial role in the generation of cellular energy
- Levels decline sharply (by as much as 72%) after age 65, compared with youth

Indications

- A significant immunologic stimulant
- Increases circulation
- Beneficial for the cardiovascular system
- Congestive heart failure
- Hypertension
- Post-myocardial infarction (MI)
- Low HDL-cholesterol
- Elevated Lipoprotein (a) and cardio-CRP
- Concomitant use with statin drugs, beta-blockers (specifically propranolol, metoprolol, and alprenolol), antipsychotic drugs in the phenothiazine family, tricyclic antidepressants, methyldopa, hydrochlorothiazide, clonidine, or hydralazine
- Overactive thyroid
- Periodontal disease
- End-stage renal disease
- Vegetarian diet

Dietary Sources

- Because CoQ_{10} is found in all animal and plant cells, we obtain small amounts of this nutrient from our diet. However, it would be hard to get a therapeutic dosage from food. Levels may be low in vegetarians

Dosage

- Ideally, based upon blood levels.
- The usual dosage is 50mg/day with meals, with a range of 50-300mg/day The dosage should be adjusted according to the response of the patient
- Prevention (blood level of 3 mcg/mL): 75 mg twice daily
- Anti-aging effects (blood level of 7 mcg/mL): 100-150 mg twice daily
- Congestive heart failure (blood level of 3-4 mcg/mL): 200-400 mg/day, depending upon patient weight. See Congestive Heart Failure section. CHF patients will achieve higher blood levels using the ubiquinol for rather than the ubiquinone form. Improvement may take more than one month. Consider working up to the full dose over a period of weeks when starting therapy, as some people experience heart pain with full dose therapy
- For Parkinson's disease (blood level of at least 7 mcg/mL) 300-1,200 mg/day; for Hypertension 120 mg; for HIV/AIDS 200 mg; for muscular dystrophy 100 mg; for mitochondrial encephalomyopathies 150 to 160 mg and sometimes higher; for increasing sperm motility 200

mg.
- Divided dosing (taking two or three equally divided smaller doses instead of one large dose a day) is recommended when the total daily dose exceeds 100 mg.
- The dry dosage form (tablet or capsule), is best absorbed when fats or oils are present in the GI tract, so take the supplement with meals. A softgel isn't considered a dry form

Side Effects / Adverse Reactions

- Epigastric discomfort, loss of appetite, nausea, diarrhea, photophobia, insomnia

Precautions / Interactions / Contraindications

- Because safety during pregnancy and lactation has not been proven, Co-Q10 should not be used during these times unless the potential clinical benefit outweighs the risks
- Individuals with diabetes and those taking blood thinners are advised to consult a physician before taking this supplement, because of potential drug interactions

Copper

Biochemical Effects

- Copper is a trace mineral
- Copper may have antioxidant activity
- Forms the active site of cytoplasmic superoxide dismutase, an enzyme that detoxifies oxygen radicals
- Found in bone and connective tissue
- Copper deficiency has been found to increase oxidative DNA damage in lymphocytes
- Copper is a cofactor for other antioxidant enzymes
- Increases iron assimilation
- Influences overall healing and protein metabolism

Indications

- May have some anticancer effects
- May be of benefit with arthritis
- Deficiencies are commonly seen with any disease affecting upper GI absorption
- When using drugs that block acid secretion

Dietary Sources

- Organ meats (liver, kidney), vegetables, nuts, seeds, legumes, the bran and germ portions of grains, liver kidneys, shellfish, oysters and crustaceans

Dosage

- Doses range from 1.5 – 3.0 mg daily

Interactions

- Penacillamine: Concomitant use may cause decreased absorption of both substances
- Iron: Excessive intake of nonheme iron may decrease copper status
- Molybdenum: Excessive intake may decrease copper status
- Drugs that block acid secretion (e.g., H2 blockers and Proton pump inhibitors) impede copper absorption
- Excessive use of zinc may cause decreased absorption of copper
- Vitamin C: Supplementation of 1,500 mg daily may cause the activity of copper transporting protein ceruloplasmin to decline
- Foods:
    - Concomitant intake of copper with foods rich in phytic acid (unleavened bread, raw beans, seeds, nuts and grains and soy isolates) may decrease absorption
    - Diets high in fructose may decrease copper status

Side Effects/Toxicity

- Copper in gram amounts is extremely toxic and can cause coma, oliguria, hepatic necrosis, vascular collapse and death
- Excessive copper intake produces nausea and vomiting, epigastric pain and diarrhea

Contraindications

- Supplemental copper is contraindicated in those with Wilson’s disease, a disease of abnormal

copper accumulation
- Supplemental copper is contraindicated in those hypersensitive to any component of a copper-containing nutritional supplement
- Pregnant women and nursing mothers should avoid doses of copper above the upper limit of the stated safe and adequate daily dietary intake, 1.5 – 3.0 mg daily
- Those with chronic liver failure and chronic renal failure should exercise extreme caution in the use of copper supplements

Creatine

Biochemical Effects

- May have an energy-enhancing action during anaerobic exercise
- May have neuroprotective and cardioprotective actions
- In muscle and nerve, most is phosphorylated to phosphocreatine (PCr), part of a cellular energy buffering and transport system
- PCr is the limiting factor of skeletal muscle performance during high intensity and brief bursts (about 10 seconds) of activity

Indications

- May increase PCr levels in skeletal muscle and hypothetically enhance ATP turnover during maximal exercise
- May enhance performance in a limited number of high-intensity, short-term physical activities
- May be helpful in treating muscular dystrophy and amyotrophic lateral scleroses
- May improve skeletal muscle function in some with congestive hart failure

Dosage

- Loading dose: 20 grams or 0.3 grams/kilogram body weight, in divided doses 4 times daily for 2-5 days
- Maintenance dose: 2 grams daily or 0.03 grams/kilogram body weight
- Drink adequate water: at least 6-8 glasses per day
- Discontinue use after 8 weeks for 2 months prior to cycling on again

Interactions

- No known drug, nutritional supplement or herb interactions
- Caffeine interferes with any beneficial effects of Creatine supplementation

Side Effects, Adverse Reactions

- Nausea, diarrhea, indigestion
- Muscle cramps and strains
- Weight gain and water retention
- Elevated serum creatinine

Contraindications, Precautions

- Contraindicated with renal failure and renal disorders
- Children, adolescents and pregnant women should avoid use
- Anyone with renal disorders and diabetics should avoid use
- Monitor serum Creatinine levels

Curcumin

Biochemical Effects

- Polyphenolic pigments found in the spice turmeric, responsible for the yellow color of turmeric and curry
- Antioxidant activity
- Inhibits oxidation of LDL cholesterol
- Inhibits the pro-inflammatory COX and LOX enzyme
- Inhibits expression of NF-KB, which regulates inflammation and the immune system response in

tissue
- Anti-inflammatory activity
- May have anticarcinogenic activity, by inhibiting angiogenesis and arresting the growth of cells in the G2 stage of development
- May have anti-cholesterolemic activity
- May have antiviral activity

Indications

- Antioxidant
- Reduce inflammation
- Reduce atherosclerosis risk
- May reduce cancer risk
- May provide antiviral protection

Dietary Sources

- Turmeric

Dosage

- 500-8000 mg daily, with meals

Interactions

- Chemotherapeutic agents:
  - May enhance antitumor effect of cisplatin against fibrosarcoma
  - May decrease the clastogenic effect of cisplatin
  - May decreasse the nephrotoxicity due to doxorubicin and decrease the chromosomal aberrations due to bleomycin
- May enhance the action of anti-platelet drugs
- May enhance the anticoalgulant effect of warfarin
- Bromelain may enhance absorption of curcumin
- Piperine may enhance absorption of curumin

Side Effects/Toxicity

- Epigastric distress and nausea
- May cause gastritis and peptic ulcer disease if taken without food

Contraindications/Precautions

- Should be avoided by those hypersensitive to any component of a curcuminoid-containing supplement
- Contraindicated in those with bile duct obstruction and those with gallstones. May stimulate bile production in some
- Those with gastroesophageal reflux disease (GERD) and those with a history of peptic ulcer disease should exercise caution
- Those on warfarin (Coumadin) or anti-platelet drugs should exercise caution

Diindolylmethane (DIM)

Biochemical Effects

- A cruciferous substance which is active in promoting beneficial estrogen metabolism in women; it shifts the metabolism pathway to favor the production of 2-hydroxyestrone
- Associated with protection against breast cancer; low levels of this metabolite have been associated with breast cancer in men and women, uterine cancer, cervical cancer and systemic lupus erythematosis. DIM has shown a strong antiproliferative effect on human endometrial cancer cells.
- Antioxidant effects

Indications

- Breast cancer prevention
- Control of cervical dysplasia

Dietary Sources

- Cruciferous vegetables

Dosage

- Usual dose is about 150-400 mg/day
- Range: 100-600 mg/day

Interactions

- Possible interaction with oral contraceptives

Side Effects/Toxicity

- No side effects noted at usual dose or even at 3 times the usual dose
- No reported tumor promotion

D-Ribose

Biochemical Effects

- A naturally occurring, five-carbon sugar
- Physical stress can increase the loss of nucleotides (such as ATP, ADP and AMP) from the heart and skeletal muscles. Ribose metabolizes into 5-phophoribosyl-1-pyrophosphate (PRPP), which is a rate limiting substance used in the synthesis of nucleotides

Indications

- May have metabolic cardioprotective activity
- May have protective effects in cardiac ischemia, heart failure, dilated Cardiomyopathy, frequent angina, fibromyalgia and neuromuscular disease
- May enhance purine biosynthesis
- May enhance ATP energy levels
- May be beneficial in adenylosuccinase deficiency and myoadenylade deaminase deficiency

Dietary Sources

- Brewer's yeast

Dosage

- Cardiovascular prevention for athletes on maintenance and healthy people doing strenuous activity: 5 grams before workouts
- Heart failure, ischemic cardiovascular disease, peripheral vascular disease, those recovering from heart surgery or heart attacks, for the treatment of stable angina, and for athletes working out in chronic bouts of high-intensity exercise: 5 grams 2-3 times daily with meals
- Advanced heart failure, dilated Cardiomyopathy, frequent angina, individuals awaiting heart transplant, and fibromyalgia or neuromuscular disease: 15-30 grams daily in divided doses up to 3-4 times daily
- Start at the upper level of each range for patients with heart or peripheral vascular disease. Doses up to 10 grams should be taken as two 5-grams doses with morning or evening meals or just before nad after exercise. Larger doses should be taken in three or four smaller doses of 5 grams each.

Interactions

- Antidiabetic drugs: D-ribose may cause hypoglycemia. Diabetics who use D-ribose must have their blood glucose levels closely monitored and heir antidiabetic medicines appropriately adjusted, if necessary

Side Effects/Toxicity

- No reports of overdose
- Supplemental D-ribose may cause hypoglycemia and elevation of uric acid levels. Those with gout should avoid supplemental D-ribose, and those with elevated uric acid levels and hypoglycemics should exercise caution in its use. Those with diabetes should also exercise caution in its use. And those diabetics who decide to try D-ribose must be under a physician's supervision and have their blood glucose levels closely monitored and their antidiabetic medications appropriately adjusted, if necessary
- Reported adverse reactions include hypoglycemia, Hyperuricemia, hyperuricosuria, diarrhea, nausea and headache, light-headedness.

Contraindications

- None known

Enzymes

Biochemical Effects

- Digestive enzymes are secreted along the gastrointestinal tract and break down foods, enabling the nutrients to be absorbed into the bloodstream
- Amylase — breaks down carbohydrates
- Lipase — aids in fat digestion
- Protease — helps digest protein

Indications

- Malabsorption of nutrients
- Lipase - celiac disease (enhances the benefit of a gluten-free diet) Indigestion and irritable bowel syndrome (by reducing bloating, gas, and fullness following a high-fat meal)
- Lipase - food allergies, cystic fibrosis, and autoimmune disorders (i.e. rheumatoid arthritis and lupus)

Dosage

- Lipase - for adults 1- 2 capsules of 6000LU (lipase activity units) three times a day
- Digestive enzymes should be taken during or after meals

Interactions

- Orlistat will interfere with the activity of lipase supplements

Side Effects/Toxicity

- People who have hemophilia or who take anticoagulants should consult their health care provider before taking large amounts of enzymes

EPA-DHA (Omega 3)

Biochemical Effects

- Eicosapentaenoic acid and docosahexanoic acid are required for complete brain development during pregnancy and the first two years of life
- Antiatherogenic, antihyperlipoproteinemic, anti-inflammatory effects by reducing production of thromboxane and decreasing platelet aggregation

Indications

- Cardiovascular disease
- Hypercholesterolemia and hypertriglyceridemia
- Hypertension
- Autoimmune disease and inflammatory disorders
- Cancer

Dietary Sources

- Cold water fish
- Phytoplankton

Dosage

- 2.5 gm daily
- Dosage range is 1.5-15 grams/day

Interactions

- Concomitant use with aspirin and other non-steroidal anti-inflammatory drugs and herbs such as garlic and ginkgo may rarely increase susceptibility to bruising, nosebleeds, hemoptysis, hematemesis, hematuria, and blood in the stool

Side Effects/Toxicity

- There have been no reports of serious adverse events in those taking fish oil supplements, even up to 15 gm daily for prolonged periods of time.
- Mild gastrointestinal upsets such as nausea and diarrhea, halitosis, eructation and “fishy” smelling breath, skin and even urine.

Contraindications

- None known
- Hemophiliacs and those taking warfarin should exercise caution

- Fish oil supplements should be stopped before any surgical procedure

Folate (Folic Acid in synthetic form)

Biochemical Effects

- Necessary for the synthesis, function and protection of DNA
- Plays a role in central nervous system function, immune function, and homocysteine metabolism
- Involved with many neurotransmitters that have to do with mood and behavior
- Enables the synthesis of new proteins (together with vitamins B6 and B12)
- Necessary for normal cell function and tissue growth
- Necessary for red blood cell production
- May have anti-arthritic, anti-arteriosclerotic, and anti-depressant effects

Indications

- Protection against cardiovascular disease and some forms of cancer
- May be useful in reducing symptoms of some psychiatric disorders
- May help prevent Alzheimer's disease
- As a supplement to prevent neural tube birth defects

Dietary Sources

- Large amounts in liver and lower concentration in beef, lamb, pork, dark-green leafy vegetables (spinach, turnip greens, endive, broccoli, and asparagus), citrus fruits, whole grains, wheat germ, avocados, dried beans and peas

Dosage

- 400 - 1200 mcg daily
- Dosage range is 0.4 – 5 mg daily

Interactions

- Concomitant use of anticonvulsants, cholestyramine, colestipol, colchicines, metformin, nonsteroidal anti-inflammatory drugs, phenytoin, sulfasalazine and zinc may reduce levels of folate or folate absorption.

Side Effects/Toxicity

- Possible side effects include bright yellow urine, diarrhea, fever, and skin rash
- There are no reports of overdosage
- May cause uricosuria and 1500 mcg/day can result in abdominal distension, appetite loss, flatulence, and nausea

Contraindications

- Hypersensitivity to any component of a folic acid-containing product
- Those with undiagnosed anemia should use caution in the use of folic acid supplements
- May precipitate or exacerbate the neurological damage of vitamin B12 deficiency

Garlic

Biochemical Effects

- Antimicrobial
- Antioxidative
- Fibrinolytic
- Lipid reducing
- May enhance natural killer (NK) cells

Indications

- May be useful in the treatment of arteriosclerosis
- May be useful in the treatment of hypertension
- May be useful in the treatment of high cholesterol and high LDL cholesterol
- May lower triglycerides

Dosage

- 500-1000 mg daily

Interactions

- Concomitant use with anticoagulants such as coumadin and antiplatelets such as aspirin and

dipyridamole could increase the risk of bleeding due to the effect of garlic on platelet aggregation and fibrinogen

Side Effects/Toxicity

- Adverse effects such as headache, myalgia, fatigue and vertigo have been seen wit therapeutic doses of garlic
- Frequent contact with the drug may result in allergic reactions such as contact dermatitis and asthma
- Abdominal discomfort, nausea, vomiting, diarrhea and a feeling of fullness have occurred with garlic therapy
- A significant decrease in hematocrit values and plasma viscosity have been associated with the administration of garlic powder there has been risk of postoperative bleeding with TURP or mammaplasty surgery. Also, spontaneous spinal epidural hematoma has been reported with garlic
- Occupational asthma induced by inhalation and ingestion of garlic has been observed
- Garlic therapy is associated with body odor or halitosis
- Not to be used while nursing

Contraindications

- None known

Ginkgo biloba

Biochemical Effects

- Inhibits platelet-activating factor (PAF), which is important for the induction of arachidonate-independent platelet aggregation
- Ischemic protective effects
- Antioxidant effects
- Prevents lipid peroxidation
- Reduces neutrophil infiltration and increases blood flow to prevent the progression of dementia ischemia
- Antioxidant and membrane-stabilizing activity increases cerebral hypoxia tolerance
- Smooth muscle relaxing properties

Indications

- Symptomatic relief of organic brain dysfunction
- Intermittent claudication
- Vertigo (vascular origin)
- Tinnitus (vascular origin)
- May improve concentration and memory deficits as a result of peripheral arterial occlusive disease

Dosage

- 120 - 240 mg daily

Interactions

- Antithromobolytic agents (anticoagulants, antiplatelets, and aspirin) – Spontaneous bleeding has been associated with the herb due to its potent inhibitory effect on the platelet-activating factor (PAF)
- Risk of intracerebral hemorrhage with the use of thrombolytic therapy

Side Effects/Toxicity

- Health risks of side effects following the proper administration of designated therapeutic dosages are not recorded
- Mild gastrointestinal complaints could occur
- Blood pressure problems, allergic reactions and phlebitis have occasionally been documented after parenteral administration.
- Allergic skin reactions have been observed on extremely rare occasions
- Possible hypersensitivity reactions with spasms and cramps and, in the case of acute toxicity, atonia and adynamia
- Spontaneous bilateral subdural hematomas, subarachnoid hemorrhage and an increase in

bleeding time have been associated with chronic Ginkgo biloba ingestion

Contraindications

- Hypersensitivity to Ginkgo biloba preparations
- Patients with known risk factors for intracranial hemorrhage (systematic arterial hypertension, diabetes, amyloid senile plaques) should avoid the use of Ginkgo biloba

GLA – Gamma Linolenic Acid (Omega 6)

Biochemical Effects

- Omega-6 is an essential polyunsaturated fatty acid
- Most omega-6 fatty acids are consumed in the diet as lineoleic acid (LA), which is converted to gamma linolenic acid (GLA), and is then converted to arachadonic acid (AA)
- GLA can also be directly ingested from several plant-based oils including evening primrose oil (EPO), borage oil, and black currant seed oil
- GLA is thought to reduce inflammation
- GLA taken as a supplement is converted to dihomogamma-linolenic acid (DGLA), which competes with AA and prevents the negative inflammatory effects of AA; having enough magnesium, zinc, vitamin C, B3, and B6 help to promote conversion to DGLA instead of AA

Indications

- Cancer, principally cerebral gliomas
- Hypertension and cardiovascular disease
- Diabetes
- Diabetic neuropathy
- Rheumatoid arthritis
- Atopic dermatitis and atopic eczema

Dietary Sources

- Primrose seed oil, blackcurrant seed oil, borage oil

Dosage

- Omega-6 fatty acids should be taken in a balance with omega-3 fatty acids; this should be a ratio of omega-6:omega-3 in a range of 1:1 to 4:1
- Up to 2 grams daily may help elevated triglycerides
- Up to 2.8 grams daily may help rheumatoid arthritis and other conditions
- The dose of omega-6 should not exceed 3000mg/day because at higher levels AA will be produced instead of DGLA

Interactions

- No known interactions with aspirin, other NSAIDs, or herbs, such as garlic or ginkgo

Precautions / Interactions / Contraindications

- GLA should not be used if a patient has a seizure disorder
- It should also not be used in pregnancy
- No overdosage has been reported

Glucosamine Sulfate

Biochemical effects

- Glucosamine sulfate is the only form of glucosamine that has been the subject of scientific investigations and studies, and is the preferred form (over glucosamine hydrochloride and N-acetyl-glucosamine) for clinical effectiveness
- Glucosamine stimulates production of the components of cartilage and allows for the rebuilding of damaged cartilage

Indications

- Osteoarthritis

Dosage

- Standard dose is 500 mg three times a day
- Obese patients may need a higher dose based on body weight (20mg/kg) and patients who are taking diuretics may need a higher dose

Interactions

- No drug interactions reported
- Drug-disease interaction-may impair insulin secretion, therefore, monitor glucose levels in diabetic patients

Side effects/toxicity

- Excellent safety record, with the only reported side effects being light to moderate gastrointestinal symptoms, such as stomach upset, heartburn, diarrhea, nausea, and indigestion; if these symptoms do occur glucosamine should be taken with meals
- No allergic reactions have been reported due to the sulfur component of glucosamine sulfate

Glutathione

Biochemical effects

- Antioxidant activity
- May have detoxification and immunomodulatory activities
- May have beneficial effects on sperm motility
- May have beneficial effects in the protection against noise-induced hearing loss
- May have some anti-viral activity
- Low levels are associated with many neuro-degenerative diseases, such as MS, ALS, Alzheimer's disease, and Parkinsonism

Indications

- May be useful in the prevention and management of some cancers
- May be useful in the management of atherosclerosis
- May be useful in the management of diabetes
- May be useful in the management of lung disorders
- May be useful in the management of noise-induced hearing loss
- May be useful in the management of male infertility

Dosage

- 50 mg daily

Interactions

- Cisplatin: Glutathione, administered parenterally, may ameliorate some of the adverse reactions of cisplatin

Side effects/toxicity

- Doses of up to 600 mg daily are well tolerated
- No drug interactions reported
- Pregnant women and nursing mothers should avoid the use of supplementary glutathione
- There have been no reports of overdosage

Contraindications

- Hypersensitivity to any component of a glutathione-containing product

Grape Seed Extract

Biochemical effects

- Antioxidant activity
- May have anti-inflammatory activities
- May have anticarcinogenic activities
- May have anti-atherogenic activities
- Inhibits platelet aggregation
- PCOs (oligomeric procyanidolic complexes) strengthen skin connective tissue

Indications

- May have anticancer activity
- May protect against some forms of lipid peroxidation
- May be cardioprotective
- May be hepatoprotective
- May be capillary protective

Dietary Sources

- Grapes, blueberries, cherries, plums (mainly in the peels, skins, or seeds)

Dosage

- 50 – 100 mg daily
- Use standardized concentration of 95% PCOs (oligomeric procyanidolic complexes)

Interactions

- None known

Side effects/toxicity

- None known

Contraindications

- Hypersensitivity to any of the ingredients in a grape seed proanthocyanidin-containing product
- Should be avoided in by pregnant women and nursing mothers

Green Tea Extract

Biochemical effects

- Antioxidant activity
- Polyphenols support immune and cardiovascular health and liver detoxification
- May have anti-inflammatory activities
- May have anticarcinogenic activities
- May have anti-atherogenic activities
- May have antimicrobial activities
- May have thermogenic activities
- May have antibacterial action

Indications

- May be useful as an anticarcinogenic agent
- May be useful to prevent atherosclerosis
- May be useful as an anti-inflammatory agent
- May be useful as an anti-microbial agent
- Reported thermogenic effects may be helpful in controlling body weight

Dosage

- 300-600 mg daily
- use a standardized extract, with at least 50% catechins and 90% total polyphenols

Interactions

- May enhance the effect of platelet active drugs
- May have a synergistic effect with caffeine in enhancing thermogenesis
- May inhibit catechol-O-methyl-transferase, and enzyme that metabolizes norepinephrine
- Caffeine may inhibit cyclic AMP phosphodiesterase, an enzyme that metabolizes norepinephrine-induced cyclic AMP
- May enhance the effects of chemotherapeutic agents such as doxorubicin and may ameliorate some of their toxicity

Side effects/Toxicity

- None known
- No reported overdosage

Contraindications

- Hypersensitivity to any components of a green tea-containing product
- Should be avoided in by pregnant women and nursing mothers
- Catechins may decrease platelet aggregation. Those taking drugs affecting platelet aggregation, such as aspirin, those taking warfarin and those with either genetic or acquired bleeding tendencies should exercise caution in the use of green tea catechin supplements
- Should be stopped before any surgical procedure

Hawthorn

Biochemical Effects

- Contains anthocyanins-type pigments, choline, citric acid, flavone, flavonoids, folic acid, Pantothenic acid, saponins, vitamins B1, B2, B3, B6, B12, C
- May dilate coronary blood vessels
- May restore or strengthen heart muscle
- May lower cholesterol levels
- May increase intracellular vitamin C levels
- causes release of Angiotensin II

Indications

- May be useful for anemia
- May be useful for cardiovascular and circulatory disorders
- May be useful for hypertension
- May lower cholesterol levels

Dosage

- Extract standardized for 1.8-2.2% vitexin flavonoids 100-500 mg three times daily

Interactions

-

Side Effects/Toxicity

-

Contraindications

-

Indole-3-Carbinol

Biochemical effects

- Antioxidant activity
- Modulates estrogen metabolism
- May have anticarcinogenic activities
- May have anti-atherogenic activities
- Helps detoxify the liver

Indications

- May be useful as an anticarcinogenic agent, particularly breast and prostate cancer
- May be useful to prevent atherosclerosis
- May be useful in inhibiting the formation of pillomatosis cysts caused by the human papilloma virus (HPV)

Dietary Sources

- Cruciferous vegetables (broccoli, cauliflower, Brussels sprouts, kale, mustard greens)

Dosage

- Body weight of 120 lb. or less: 200 mg twice daily
- Body weight of 120 – 180 lb.: 200 mg 3 times daily
- Body weight over 180 lb.: 200 mg 4 times daily

Interactions

- Antacids, H2 blockers, proton pump inhibitors: The conversion of indole-3-carbinol to DIM and ICZ requires stomach acid
- Tamoxifen: Indole-3-carbinol may be synergistic with tamoxifen in protecting against breast cancer

Side effects/toxicity

- None known

Contraindications

- Hypersensitivity to this substance or to any components of an indole-3-carbinol-containing product
- Should be avoided in by pregnant women and nursing mothers
- Those with cancer should confer with their physician before deciding to use indole-3-carbinol

Inositol

Biochemical Effects

- Inositol is an important component of cell membranes
- It is necessary for proper nerve, brain, and muscle function
- Helps to prevent the accumulation of fats in the liver
- Has also demonstrated qualities useful in the prevention and treatment of cancer, (the quantity of inositol hexaphosphate in fiber may partly explain why high-fiber diets are associated with a lower incidence of cancer)
- Serotonin and acetylcholine in the brain depend on inositol for proper functioning, therefore, low levels may result in depression
- The loss of inositol from the nerve cell is a major cause of decreased nerve function-therefore, inositol may help in diabetic neuropathy

Indications

- Moving fats out of the liver
- May help protect against cardiovascular disease, peripheral neuritis
- May lower blood cholesterol levels
- Promote production of lecithin

Dosage

- Supplement dose 100 mg/day
- To treat liver conditions 100-500 mg/day
- For depression and panic disorder 12g/day
- For a supplement to diabetic treatment I -2g/day

Interactions

- Caffeine
- Antibiotics, and the use of sulfonamides increases the need for inositol

Side effects/toxicity

- No known toxicity
- Consult physician if diabetes with peripheral neuropathy

Iodine

Biochemical Effects

- Iodine is an essential trace element which is vital to the function of the thyroid gland
- In addition to iodized salt, rich sources of iodine include fish and sea vegetables. It is also available in animal products, such as eggs, milk, meat and poultry
- Iodine's major action is its precursor role in the formation of thyroid hormones

Indications

- Use in iodine-deficiency disorders
- May be protective against radioactive iodine and consequent thyroid cancer
- Used therapeutically for the treatment of certain hyperthyroid conditions and thyroid storm
- Used as an expectorant
- May ameliorate some of the symptoms of fibrocystic disease of the breast

Dietary Sources

- Fish and sea vegetables (seaweeds)
- Iodized salt
- Eggs, milk, meat and poultry

Dosage

- 150 mcg daily

Interactions

- Anti-thyroid drugs: concomitant use may potentiate the hypothyroid effect of iodides
- Lithium: Concomitant use may result in hypothyroidism
- Warfarin: Concomitant use may decrease the anticoagulant effectiveness of warfarin
- Selenium: Intake may have synergistic activity in the treatment of Kashin-Beck disease, an

osteoarthropathy
- Foods:
  - Goiterogens are found in foods such as cassava and such cruciferous foods as cabbage, Brussels sprouts, broccoli, cauliflower and rutabaga
  - The soybean isoflavones genistein and daidzein have been found to inhibit thyroid peroxidase

Side Effects/Toxicity

- Doses up to 1,000 mg daily are generally well tolerated
- Adverse reactions include hypersensitivity reactions, flare-up of adolescent acne, rashes, arrhythmias, central nervous system effects, hypothyroidism, hyperthyroidism, parotitis, thyroid adenoma and small bowel lesions
- Manifestations of hypersensitivity reactions include angioedema, symptoms resembling serum sickness, cutaneous and mucosal hemorrhages, urticaria, thrombotic thrombocytopenia purpura and fatal periarteritis. Nonspecific small bowel lesions manifested by stenosis with or without ulceration have been associated with the use of enteric coated potassium iodide.
- Chronic intake of pharmacological doses of iodides can lead to iodism, characterized by frontal headache, pulmonary edema, coryza, eye irritation, skin eruptions, gastric disturbances and inflammation of the tonsils, larynx, pharynx and submaxillary and parotid glands
- Potassium iodide in pharmacological doses to those with impaired renal function may lead to serious hyperkalemia
- The most common adverse effect of salt iodization is the development of iodine-induced hyperthyroidism

Contraindications

- Iodine is contraindicated in those hypersensitive to any component of iodine-containing product
- Pregnant women and nursing mothers avoid intake of iodine greater than RDA amounts
- Older people with nodular goiters are at risk of developing hyperthyroidism from use of potassium iodide and iodized salt
- Potassium iodide and iodized salt may exacerbate symptoms in some with autoimmune thyroiditis

L-Arginine

Biochemical Effects

- Dilates blood vessels
- Reduces blood pressure
- Replicates the activity of nitroglycerine
- Is needed to produce nitric acid
- May have anti-atherogenic, antioxidant and immunomodulatory actions
- The precursor to nitric oxide, which plays an important role in the cardiovascular system, immune system and nervous system

Indications

- Prevention and treatment of cardiovascular disease, including atherosclerosis, hypertension, hyperlipidemia and angina pectoris
- Treatment of some forms of male infertility and some kidney disorders
- Has demonstrated some positive immune-modulating and anticancer effects
- May be helpful in some men with erectile dysfunction and in some other migraine, liver disease and primary ciliary dyskinesia

Dietary Sources

- Most protein foods and carob, chocolate, nuts, seeds, beans, oats, peanuts, and wheat and wheat germ

Dosage

- 2 grams before bedtime for most individuals
- For cardiovascular health reasons, doses from 8-21 grams daily have been used in divided doses
- Doses of 5 grams daily have been used for erectile dysfunction

Interactions

- May counteract the anti-naturetic effect of cyclosporine

- May increase the absorption of ibuprofen if taken concomitantly
- Theoretically may potentiate the effects of organic nitrates if taken concomitantly
- Theoretically may potentiate the effects of sildenafil citrate
- May enhance the effect of yohimbe

Side Effects/Toxicity

- Oral doses up to 15 grams daily are generally well tolerated
- The most common adverse reactions of higher doses – 15-30 grams daily – are nausea, abdominal cramps and diarrhea. Some may experience these symptoms at lower doses

Contraindications

- Arginine can elevate blood sugar by neutralizing insulin in some Type-II diabetics. Those diabetics contemplating using arginine should check their blood sugar with a glucometer every time they take the supplement during the first 3 weeks of treatment.
- Individuals who have frequent herpes outbreaks may find arginine-rich foodstuffs or supplementation contraindicated.
- Pregnant women and nursing mothers should avoid L-arginine supplementation
- Those with renal or hepatic failure should exercise caution

L-Glutamine

Biochemical Effects

- Generally manufactured by the body, mainly the skeletal muscles
- Depletion is a typical feature of such metabolic stress conditions as trauma, infection, sepsis, cancer, and severe burns
- Immunomodulatory actions
- May have anti-catabolic/anabolic actions
- May have antioxidant actions
- May have gut mucosal barrier-protective actions

Indications

- Helpful in the recovery of trauma, surgical and other critically ill patients
- No clear evidence that oral supplementation has anabolic or ergogenic effects in those who are not metabolically compromised
- May help protect against exercise-induced immune impairment

Dietary Sources

- Animal and plant proteins
- Small amounts are found in vegetable juices and fermented foods, such as miso and yogurt

Dose

- Surgical trauma: 12 grams daily
- Severe trauma and infections: 25 grams daily
- Fitness: 1.5-4.5 grams daily, between meals

Interactions

- Concomitant use with human growth hormone may enhance nutrient absorption in those with severe short bowel syndrome
- Concomitant use with indomethacin may ameliorate increased intestinal permeability caused by indomethacin

Side Effects/Toxicity

- Those with renal or hepatic failure should exercise caution
- Doses of up to 21 grams daily appear to be well tolerated.
- Reported adverse reactions are mainly gastrointestinal and not common. They include constipation and bloating

Contraindications

- contraindicated in those hypersensitive to any component of a glutamine-containing product

L-Theanine

Biochemical Effects

- A non-protein amino acid mainly found in the green tea plant
- A derivative of L-Glutamic acid
- May have activity in modulating the metabolism of cancer chemotherapeutic agents and ameliorating their side effects
- May have mood-modulating activity

Indications

- Anticancer activity
- Hypotensive effects
- To inhibit LDL cholesterol oxidation
- To induce relaxation

Dietary Sources

- Green tea

Dose

- 50 – 200 mg daily

Interactions

- Doxorubicin and Idarubacin: L-theanine may enhance the antitumor effects of these drugs and may ameliorate some of their side effects

Side Effects/Toxicity

- None known

Contraindications

- contraindicated in those hypersensitive to any component of a L-theanine-containing product
- pregnant women and nursing mothers should avoid L-theanine supplements

Lutein and Zeaxanthin

Biochemical Effects

- Members of the carotenoid family
- Protect humans against phototoxic damage
- Protective against some forms of cancer
- Play a role in protection against age-related macular degeneration and age-related cataracts

Indications

- Opthalmoprotection
- Prevention of age-related macular degeneration
- Prevention of age-related cataracts

Dietary Sources

- Corn, egg yolks and green vegetables and fruits, such as orange pepper, broccoli, green beans, green peas, Brussels sprouts, cabbage, kale, collard greens, spinach, lettuce, kiwi, orange juice, mango and honeydew

Dosage

- 0.25-20 mg daily
- 7-12 mg daily has been associated with a decreased risk of age-related macular degeneration

Interactions

- Cholestyramine: concomitant intake may decrease the absorption of these carotenoids
- Colestipol: concomitant intake may decrease the absorption of these carotenoids
- Mineral oil: concomitant intake may decrease the absorption of these carotenoids
- Nutritional supplements:
    - Beta-carotene: concomitant intake may decrease the absorption of these carotenoids
    - Medium-chain triglycerides: concomitant intake may enhance the absorption of these

carotenoids
    - Pectin: concomitant intake may decrease the absorption of these carotenoids
- Foods:
    - Oils: some dietary oil, such as corn oil, may increase absorption of these carotenoids
    - Olestra: concomitant intake may decrease the absorption of these carotenoids

Side Effects / Adverse Reactions

- No adverse reactions or overdosage has been reported

Precautions / Contraindications

- Contraindicated in those with known hypersensitivity to any of the ingredients of a Lutein- and zeaxanthin-containing substance

Lycopene

Biochemical Effects

- Lycopene is a natural fat-soluble carotenoid pigment found in certain plants
- Lycopene may have anticarcinogenic and antiatherogenic activities
- Lycopene may stimulate gap junction communication between cells
- Lycopene may suppress carcinogenic-induced phosphorylation of regulatory proteins
- Lycopene may reduce cellular proliferation induced by insulin-like growth factors
- Lycopene has antioxidant activity
- Lycopene inhibits cholesterol synthesis and inhibits HMG-CoA reductace activity

Indications

- May help prevent and also manage some cancers, particularly prostate cancer
- May confer some protection against cardiovascular disease
- Prevention of LDL cholesterol oxidation

Dietary Sources

- Tomatoes (especially cooked tomatoes), watermelon, beets, guava, and pink grapefruit

Dosage

- Doses range from 5 – 15 mg daily
- Optimal dose is not known

Interactions

- Cholestyramine: Concomitant intake of Cholestyramine may decrease that absorption of Lycopene
- Colestipol: Concomitant intake may decrease the absorption of lycopene
- Mineral Oil: Concomitant intake may decrease the absorption of lycopene
- Orlistat: Concomitant intake may decrease the absorption of lycopene
- Beta-carotene: Concomitant intake may increase the absorption of lycopene
- Medium-chain triglycerides: Concomitant intake may enhance the absorption of lycopene
- Pectin: Concomitant intake may decrease the absorption of lycopene
- Oils: Dietary oils, such as olive oil, may enhance the absorption of lycopene
- Olestra: Olestra may reduce the absorption of lycopene

Side Effects/Toxicity

- Unknown

Contraindications

- Lycopene is contraindicated in those hypersensitive to any component of a lycopene-containing product
- Pregnant women and nursing mothers should obtain their lycopene intake from food sources rather than supplements

Lysine

Biochemical Effects

- An essential protein amino acid
- One of many amino acids which the body needs for growth and tissue repair
- It functions as a building block for proteins

- It is also a key component of various enzymes, hormones, and antibodies

Indications

- May reduce the recurrence rate of herpes simplex virus (HSV) infections and/or reduce their severity
- Possible role in the prevention and treatment of osteoporosis
- May enhance healing of shingle's lesions

Dietary Sources

- Proteins found in meat, poultry and milk

Dosage

- Canker sores - 1000 mg L-lysine three times a day with meals while canker sore is present, then 500 mg three times a day for one week following resolution
- Cold sores/herpes - 1000 mg L-lysine three times a day with meals for flare-ups; for prevention of recurrent flare-ups use a maintenance dose of 1000 mg/day
- Shingles - 1000 mg L-lysine three times a day with meals during flare-ups, then 500 mg three times a day for one week following resolution

Interactions

- Concomitant use with calcium may increase calcium absorption
- In very large doses (10-30 grams/day) lysine increases toxicity of aminoglycoside antibiotics

Side effects/Toxicity/Contraindications

- Contraindicated in those with the rare genetic disorder hyperlysinemia/hyperlysinuria
- Proteins such as casein, which are high in L-lysine relative to L-arginine, are associated with elevated cholesterol levels. Those with hypercholesterolemia should be cautious of supplementing with L-lysine
- Those with hepatic or renal failure should exercise caution in the use of supplemental L-lysine
- Doses up to 3 grams daily are generally well tolerated
- Very high doses, greater than 10-15 grams daily – may cause abdominal cramps and diarrhea
- No reported overdosage

Magnesium

Biochemical Effects

- As a supplement magnesium is available as magnesium amino acid chelate, magnesium ascorbate, magnesium gluconate, and magnesium oxide
- Magnesium is essential for many metabolic functions, including activation of enzymes involved in the proper metabolism of protein and carbohydrates for energy production
- Needed for the function of more than 300 different enzymes
- The role of magnesium in conducting nerve impulses may make it useful in the support of cardiac function
- The primary location of magnesium is in the bone tissue and its ability to help increase calcium absorption, makes it important to bone health

Indications

- Used to build bone
- Increase energy levels
- Promote heart health
- Enhance protein synthesis
- Hypertension
- Type II diabetes mellitus
- May be useful for depression and migraines

Dietary Sources

- Dark-green vegetables, sea vegetables, whole grains and nuts

Dosage

- Normally recommended amount is 400 mg/day
- Higher levels may be needed for hypertension, to cope with stressors such as exercise, and when taking Calcium supplements to prevent bone loss or build new bone

Interactions

- Cellulose sodium phosphate can decrease the effectiveness of magnesium
- Magnesium can reduce the absorption of ketoconazole and tetracycline
- Eating soluble vitamins can decrease the absorption of magnesium
- Magnesium can decrease the excretion of mecamylamine
- Vitamin D can increase the concentration of magnesium in the body

Side Effects/Toxicity

- Side effects include abdominal pain, anorexia, diarrhea, irregular heartbeat, mood-swings, nausea, weakness, painful urination, vomiting
- Signs of toxicity include drowsiness, lethargy, nausea, vomiting, hypotension, muscle weakness, sluggishness, diminished reflexes, slow breathing, stupor, and coma
- Excessive intake can lead to deficiencies of other elements

Precautions / Contraindications

- Do not take magnesium without consulting a doctor if heart or kidney problems are present
- Contraindicated in kidney failure, heart block, ileostomy
- Do not take magnesium supplements during pregnancy or lactation without consulting a physician

Malic Acid

Biochemical Effects

- An alpha-hydroxy organic acid, sometimes referred to as a fruit acid
- A key intermediate in the Krebs cycle in the mitochondria
- In combination with magnesium, has putative antifibromyalgic activity

Indications

- Fibromyalgia

Dietary Sources

- Apples and other fruits

Dosage

- 1200-2400 mg daily, with magnesium

Interactions

- None reported

Side Effects/Toxicity

- None reported

Precautions / Contraindications

- No known contraindications
- Contraindicated in kidney failure, heart block, ileostomy
- Do not take malic acid supplements during pregnancy or lactation without consulting a physician

Manganese

Biochemical Effects

- Found in cells of the pituitary gland, liver, pancreas, kidney, and bone
- Influences the synthesis of mucopolysaccharides
- Stimulates the production of cholesterol by the liver, and is a co-factor in many enzymes
- Functions in enzyme reactions related to blood sugar, metabolism, and thyroid hormone function
- Forms the active site in mitochondrial superoxide dismutase (SOD), which is an antioxidant enzyme
- Increasing this enzyme is thought to help with the inflammation associated with rheumatoid arthritis

Indications

- Osteoporosis
- Osteoarthritis
- Helps to control blood sugar, energy, metabolism, thyroid hormone, and SOD
- Used as a treatment for sprains, strains, inflammations, epilepsy, and diabetes
- May also be useful for alleviating asthma, overcoming infertility, relieving fatigue, and as an anti-

aging substance

Dietary Sources

- Whole grains, nuts, leafy vegetables, sea vegetables, and teas

Dosage

- Optimal daily intake is 2-10mg
- Therapeutic dose for epilepsy is 15-30 mg/day
- Therapeutic dose for diabetes is 5-15mg/day

Interactions

- Zinc and antacids may inhibit manganese
- Phosphate, magnesium and calcium may decrease manganese absorption in large doses
- Manganese can interfere with iron absorption
- Oral contraceptives can decrease serum levels of manganese

Side Effects/Toxicity

- Side effects include anorexia, breathing difficulties, headaches, impotence, leg cramps, and unusual fatigue
- Supplemental manganese is associated with a low level of toxicity, however, toxicity associated with environmental pollution can be highly toxic
- Signs and symptoms include hallucinations, violent acts, and other psychological symptoms

Contraindications

- Manganese is contraindicated in those with liver failure
- Consult physician if liver disease is present
- Do not take manganese if pregnant or lactating without consulting physician

Milk Thistle (Silybum marianum)

Biochemical Effects

- Hepatoprotective activity, inhibiting entrance of toxins an blocking toxin-binding sites through alteration of the liver cell's outer membrane
- Decreases production of superoxide anion radicals and nitric oxide by the Kupffer cells
- Increases glutathione production
- Decreases hepatic and mitochondrial glutathione oxidation induced by iron overload
- Exerts an anti-inflammatory effect through inhibition of leukotriene production
- Renoprotective effects
- Reduces intracellular and secreted forms of prostate-specific antigen (PSA) levels

Indications

- Dyspeptic complaints
- Liver and gallbladder complaints
- Toxic liver damage, adjunctive treatment in chronic inflammatory liver disease and hepatic cirrhosis
- Possibly as a stimulant for functional disorders of liver and gallbladder

Dosage

- 120 – 420 mg divided in 2 – 3 doses

Interactions

- Concomitant use with butyrophenones or phenothiazines results in a reduction of lipid peroxidation
- Antagonistic effect with Yohimbine and phentolamine

Side Effects /Toxicity

- No health hazards or side effects are known in conjunction with the proper administration.

Precautions / Contraindications

- None reported in the literature

N-Acetyl Cysteine (NAC)

Biochemical effects

- Amino acid
- Antioxidant activity
- Precursor to the body's own glutathione
- Mucolytic activity
- Hepatoprotectant activity
- May have anti-apototic activities

Indications

- Inhibition of LDL cholesterol oxidation
- May help protect against cardiovascular disease
- May be useful in the treatment of diabetes
- May be useful in the treatment of some cancers and immune disorders
- May have favorable impact on age-related memory loss
- Hepatoprotective

Dosage

- 250 – 1000 mg daily

Interactions

- Use with nitrates may cause headaches
- Use with carbamazepine may cause reduced serum levels of carbamazepine

Side Effects/Toxicity

- Nausea, vomiting, diarrhea, headache and rashes. There are rare reports of renal stone formation
- There are no reports of overdosage with oral, supplemental NAC

Contraindications

- No known contraindications
- Should be avoided by nursing mothers and should only be used by pregnant women if prescribed by a physician
- May be harmful if administered early in the treatment of critically ill patients
- Those who form renal stones, particularly cystine stones, should avoid NAC
- NAC could produce a false-positive result in the nitroprusside test for ketone bodies used in diabetes
- Use with caution in those with a history of peptic ulcer disease

Niacin (Vitamin B3)

Biochemical Effects

- Niacin (Vitamin B3) is needed for proper circulation and healthy skin
- Provides support for oxidation and reduction reactions, digestive functions and synthesis of the building blocks of DNA
- It aids in the functioning of the nervous system; in the metabolism of carbohydrates, fats, and proteins; and in the production of hydrochloric acid for the digestive system.
- Niacin lowers cholesterol and improves circulation.

Indications

- Lowering cholesterol
- Lowering triglycerides
- Useful to help protect against atherosclerosis
- Reduces fibrinogen levels

Dietary Sources

- Beans, meats, fish, poultry, vegetables, yeast, whole grains and eggs

Dosage

- 50 – 150 mg daily
- Higher doses, up to 3-5 gm/d, to treat hyperlipidemias as prescribed by a physician

Side Effects / Adverse Reactions

- Nicotinic acid can cause vasodilatation of cutaneous blood vessels, resulting in increased blood flow to the face, neck and chest. The symptoms of flushing include a burning, tingling and itching

sensation, a reddened flush occurs primarily on the face, arms and chest. It is often accompanied by itching and headaches
- The flushing is transient and tolerance occurs with continued administration
- Dizziness, palpitations, tachycardia, shortness of breath, sweating, chills, insomnia, nausea, vomiting, abdominal pain and myalgias
- Doses of at least 3 gm daily have caused impaired glucose tolerance in otherwise healthy individuals
- May increase uric acid levels
- There are no reports of overdosage

Interactions

- May potentiate the action of alpha blockers, calcium channel blockers, ganglionic blocking agents, nitrates and warfarin
- May antagonize the effects of alpha-blockers, alpha-glucosidase inhibitors, metformin, meglitinides, sulfonylureas, and thiazolidinediones
- Cholestyramine and colestipol may interfere with absorption of nicotinic acid
- NSAIDs, taken 30-60 minutes before a dose of nicotinic acid, my blunt the flushing effect of high-dose nicotinic acid
- Concomitant use with alcohol or hot foods and beverages may cause increased flushing

Precautions

- People who are pregnant or who suffer from diabetes, glaucoma, gout, liver disease, or peptic ulcers should use niacin supplements with caution
- Niacin may elevate blood sugar levels.
- Amounts over 500mg daily may cause liver damage if taken for prolonged periods
- Concomitant use of HMG-CoA reductase inhibitors and niacin can cause rhabdomyolysis
- Niacin may potentiate the action of vasoactive drugs, potentially resulting in postural hypotension

Contraindications

- Hypersensitivity to any component of a niacin-containing product
- High dose nicotinic acid is contraindicated in those with hepatic dysfunction, unexplained elevations of serum aminotransferases, active peptic ulcer disease and arterial bleeding
- Pregnant women and nursing mothers should avoid supplement doses greater than 20 mg daily unless prescribed by their physicians
- The use of nicotinic acid as an antihyperlipidemic agent should only be undertaken under medical supervision
- Those with a past history of hepatobiliary disease, jaundice, peptic ulcer disease or gastritis should exercise caution in the use of high-dose nicotinic acid.
- Those with a history of diabetes, renal dysfunction, cardiovascular disease (especially acute myocardial infarction and unstable angina) and gout should exercise caution in the use of high-dose nicotinic acid
- Those who consume substantial amounts of alcohol should also exercise caution in the use of high-dose nicotinic acid
- Those who take high-dose nicotinic acid should have their serum aminotransferases levels monitored. AST, SGOT and ALT or SGPT levels should be determined prior to starting high-dose nicotinic acid therapy, then every 6-12 weeks for one year and after one year, periodically. High dose nicotinic acid should be discontinued if the aminotransferase levels are at least 3 times greater than upper limits of normal.
- Extended-release and slow-release forms of nicotinic acid should not be substituted for equivalent doses of immediate-release (crystalline) nicotinic acid
- High-dose nicotinic acid may negatively effect glucose tolerance diabetics who take nicotinic acid for lipid-lowering should have their serum glucose levels carefully monitored

Pantethine

Biochemical Effects

- An intermediate in the conversion of the B vitamin Pantothenic acid to coenzyme-A
- Found naturally in small quantities in most forms of life

Indications

- Abnormal lipids (may lower total cholesterol, LDL, and triglycerides; may raise HDL)
- Protection from cardiomuscular disease
- Can inhibit cataract formation in some animals
- May have hepatoprotective effects

Dosage

- 600-1200 mg daily

Interactions

- HMG-CoA reductase inhibitors: concomitant use may produce additive lipid-modulatory effects
- Nicotinic acid: Concomitant use may produce additive lipid-modulatory effects

Side Effects/Toxicity

- Doses up to 1200 mg daily have been well tolerated.
- Few reports of gastrointestinal effects, including nausea and heartburn

Contraindications

- Those hypersensitive to any component of a pantethine-containing product
- Pregnant mothers and nursing mothers should avoid the use of pantethine

Pantothenic Acid (Vitamin B5)

Biochemical Effects

- Pantothenic acid is vitamin B5; it is water soluble and stable in neutral environment
- It plays a key role in the metabolism of carbohydrates, proteins, and fats therefore important for the maintenance and repair of all cells and tissues
- It is involved in the synthesis of cholesterol, hormones, neurotransmitter, phospholipids, porphyrin, and antibodies
- Involved with the regulation of gene expression and in signal transduction
- It is also necessary for the functioning of the adrenal glands, proper muscle contractions, normal blood pressure, growth, nerve impulses, healthy skin, cell metabolism, and enzyme reactions
- It also increases metabolism
- Antioxidant
- Putative anti-inflammatory, wound healing and antiviral activities

Indications

- Rheumatoid arthritis
- Wound healing

Dietary Sources

- Liver, kidney, eggs, peas, corn, and yeast

Dosage

- 100-500 mg daily

Interactions

- Biotin: High doses may inhibit the absorption of biotin produced by the microflora in the large intestine.

Side Effects/Toxicity

- There are no reports of overdosage in the literature

Contraindications

- Those hypersensitive to any component of a Pantothenic acid-containing product
- Dexpanthenol, the alcohol analog, is contraindicated in those hypersensitive to any component of a dexpanthenol-containing product
- Oral and parenteral dexpanthenol are also contraindicated in those with ileus due to mechanical obstruction and those with hemophilia.

Phosphatidylcholine (Lecithin)

Biochemical Effects

- A phospholipid that is a constituent of cell membranes
- Important for normal cellular membrane composition and repair

- A major delivery system for the essential nutrient choline, a precursor to the neurotransmitter acetylcholine, the methyl donor betaine and phospholipids
- Involved in the hepatic transport of VLDL cholesterol

Indications

- May have hepatoprotective activity
- May help restore liver function in a number of disorders, including alcoholic fibrosis, and possibly viral hepatitis
- May be indicated for the treatment of some manic conditions
- May be useful in the management of Alzheimer's disease and some other cognitive disorders

Dietary Sources

- Soybean, sunflower, rapeseed, eggs

Dosage

- Typically 3-9 grams daily in divided doses

Interactions

- There are no reported drug, nutritional supplement, food or herb interactions

Side Effects/Toxicity

- There are no reports of overdosage

Contraindications

- No known contraindications
- Those with malabsorption problems may develop diarrhea or steatorrhea
- Those with antiphospholipid-antibody syndrome should exercise caution

Phosphatidylserine

Biochemical Effects

- A phospholipid that is a structural component of cell membranes
- Involved in signal transduction activity
- May have cognition enhancing activity

Indications

- Treating cognitive impairment, including Alzheimer's disease, age-associated memory impairment and some non-Alzheimer's dementias
- Possible immune enhancement
- May enhance memory
- Possible reduction of (exercise-induced) increases in cortisol

Dietary Sources

- Soya and egg yolks

Dosage

- Typically, 100 mg three times daily, with food. Total daily dose range 300-800 mg. Avoid taking it before going to bed
- Select products from a soy-derived source

Interactions

- There are no reported drug, nutritional supplement, food or herb interactions

Side Effects/Toxicity

- Occasional gastrointestinal side effects, such as nausea and indigestion
- There are no reports of overdosage

Contraindications

- Those hypersensitive to any component of the preparation
- Those with the antiphospholipid-antibody syndrome should exercise caution in the use of Phosphatidylserine and only take it under medical supervision and monitoring
- Pregnant women and nursing mothers

Piperine

Biochemical Effects

- An alkaloid found naturally in plants belonging to the Piperacaceae family

- May have bioavailability-enhancing activity for some nutritional substances and for some drugs
- Putative anti-inflammatory activity
- May have activity in promoting digestive processes
- Might be carcinogenic and cytotoxic in some circumstances
- Might interfere with reproductive processes

Indications

- Useful in increasing the bioavailability of some drugs and nutrients
- As a possible digestive aid
- May have some anticonvulsant, anticarcinogenic and anti-inflammatory use

Dietary Sources

- Black pepper

Dosage

- 5 – 15 mg daily
- Doses higher than 15 mg daily should be avoided

Interactions

- Drugs: Piperine, usually at a dose of 20 mg or greater, has been shown to inhibit the metabolism of propranolol, theophylline, phenytoin, sulfadiazine, refampicin, isoniazid, ethambutol, pyrazinamide and dapsone. This list is not inclusive. Most drugs metabolized via cytochrome P450 enzymes would likely be affected by piperine
- Nutritional supplements: Piperine at a dose of 5 mg daily has been shown to enhance the absorption of beta-carotene and coenzyme Q10. at a dose of 20 mg daily, it has ben found to enhance the absorption of curcumin. Piperine also enhances the absorption of vitamin B6, vitamin C and the mineral selenium in the form of L-selenomethionine
- Food: Piperine may enhance the absorption of beta-carotene, vitamin B6, vitamin C and L-selenomethionine found in certain foods

Side Effects/Toxicity

- No adverse reactions have been reported with doses of 15 mg or less daily

Contraindications

- Those hypersensitive to any component of the preparation
- Pregnant women and nursing mothers should avoid piperine
- Those who eat processed food containing nitrites and nitrates as food preservatives should exercise caution in the use of piperine supplements

Policosanol

Biochemical Effects

- Long-chain primary aliphatic saturated alcohols derived from sugar cane and yams
- May inhibit cholesterol synthesis in the liver
- May reduce total serum cholesterol and LDL cholesterol

Indications

- May be useful for reducing cholesterol levels
- Can reduce platelet aggregation
- May be of benefit in individuals with intermittent claudication

Dosage

- 5-20 mg once or twice daily with meals. Look for products that contain no less than 60% (% wt./wt.) octacosanol. In addition, the sum of octacosanol, tetracosanol, hexacosanol, heptacosanol, triacosanol and nonacosanol should represent no less than 85% (% wt./wt.)

Interactions

- Aspirin – synergistic with the antithrombotic properties of aspirin
- May potentiate the effects of propranolol
- No known adverse interactions with nutritional supplements, herbs, or foods

Adverse Reactions

- Mild gastrointestinal side effects, skin rash, headache, insomnia and weight loss have been reported. The incidence of these is low. Policosanol is generally well tolerated

Overdosage

- There are no reports of overdosage

Contraindications/Precautions

- Not recommended for children, pregnant women and nursing mothers
- Because of possible antithrombotic activity, those taking warfarin and hemophiliacs should exercise caution in the use of Policosanol
- Policosanol should be stopped before any surgery

Potassium

Biochemical Effect

- Important in the transmission of nerve impulses,
- Important in the contraction of cardiac, skeletal and smooth muscle
- Production of energy
- Synthesis of nucleic acids
- Maintenance of intracellular tonicity
- Maintenance of normal blood pressure
- Aids iodine in creating thyroid hormones
- Aids in building bone

Indication

- Potassium depletion states, e.g., from prolonged use of diuretics
- May be useful in the prevention and treatment of hypertension in some, notably African Americans
- May protect against stroke
- May have a number of cardioprotective benefits
- Osteoporosis prevention

Dietary Source

- Fruits and vegetables

Dosage

- Potassium Citrate or Aspartate 200-500 mg daily (39 mg = 1 milliequivalent)
- Avoid Potassium Chloride – may contribute to bone loss

Interactions

- Angiotensin Converting Enzymes (ACE) inhibitors (benazepril, captopril, enalapril, fosinopril, lisinopril, moexipril, perindopril, quinapril, ramipril, trandolapril): ACE inhibitors will produce some potassium retention by inhibiting aldosterone production. Potassium supplements should be given to those receiving ACE inhibitors only with close monitoring.
- Potassium sparing diuretics (amiloride, triamterene, sprionolactone): The concomitant administration of a potassium-sparing diuretic and a potassium supplement can produce sever hyperkalemia.

Side Effects / Toxicity

- The most common adverse reactions of potassium supplements are gastrointestinal ones and include nausea, vomiting, abdominal discomfort, flatulence and diarrhea. Taking potassium supplements with meals may reduce these adverse reactions. Rashes are occasionally reported. The most serious adverse reaction is hyperkalemia. Hyperkalemia is rare in those with normal renal function.
- Overdoses: The use of oral potassium supplements in those with normal renal function very rarely causes serious hyperkalemia. However, overdoses with oral potassium supplementsinI those with normal renal function have been reported, causing cardiac arrhythmias. Oral doses greater than 18 grams of potassium taken at one time may lead to sever hyperkalemia in those with normal renal function.

Contraindications

- Those with hyperkalemia
- Hypersensitivity to any component of a potassium-containing supplement

Probiotics (Lactobacifius spp., Bifidobacterium bifidum)

Biochemical Effects

- Promotes proper intestinal environment
- May aid in digestion and absorption of food nutrients
- As part of the normal flora of the intestine it can inhibit the overgrowth of other organisms by competing for nutrients, altering the pH of the intestinal environment, or by producing hydrogen peroxide, lactic acid, or acetic acid, (which are bacteriocidins).
- Exogenous bacterial compounds produced by L acidophilus have been shown to affect the production of interferon and some may exert activity against H. pylori.
- Some studies have shown that ingestion of L acidophilus may reduce the concentration of certain fecal enzymes that are implicated in the formation of carcinogens in the colon

Indications

- Gastrointestinal problems
- Prevention of recurrent vaginal candidiasis
- Prevention of recurrent urinary tract infections
- Peptic ulcer, H. pylori induced peptic ulcers
- Dysbiosis
- Prevention or treatment of uncomplicated diarrhea, infectious diarrhea, ulcerative colitis, irritable bowel syndrome, and diverticulitis

Dietary Sources

- Cultured dairy products, such as yogurt

Dosage

- The dosage of a commercial probiotic supplement is based upon the number of live organisms
- 1-10 billion viable organisms daily divided into 3-4 doses is sufficient for most people

Interactions

- Alcohol and antibiotics have a negative effect on probiotics
- L acidophilus interferes with the activity of sulfasalazine and chloramphenicol.

Side Effects / Toxicity

- Generally well tolerated. Mild gastrointestinal upset may occur with larger doses
- Use with caution in severely immunosuppressed patients with an impaired gut barrier

Pycnogenol

Biochemical Effects

- A specific mixture of procyanidins extracted from the bark of French maritime pine
- Antioxidant activity
- May have anti-inflammatory activity, inhibiting the expression of several inflammatory mediators
- Has putative cardiovascular-protective activity

Indications

- Free-radical-scavenging
- Cardioprotective effects
- May be helpful in some vascular disorders
- Possible immune-modulation, anti-inflammatory, and anti-cancer uses

Dietary Sources

- Procyanidins are found in such foods as cocoa and chocolate, grape seeds, aples, peanuts, almonds, cranberries and blueberries

Dosage

- 25-200 mg daily

Interactions

- The use of Pycnogenol and dextroamphetamine appeared to superior to dextroamphetamine alone in the management of attention deficit-hyperactivity disorder.

Side Effects / Adverse Reactions

- No adverse reactions or overdosage has been reported

Precautions / Contraindications

- Contraindicated in those with known hypersensitivity to any of the ingredients of a Pycnogenol-containing substance
- Should be avoided by pregnant women and nursing mothers

Quercetin

Biochemical Effects

- Member of a class of flavonoids called flavonols
- Antioxidant activity
- Anti-inflammatory activity
- Inhibits lipid peroxidation
- Antiviral activity
- Anticancer activity
- Gastroprotective activity
- Immunomodulatory activity
- May have anti-allergy activity and activity in preventing secondary complications of diabetes

Indications

- May have benefits in some allergies
- May have benefits in chronic prostatitis
- May have benefits in some cancers
- May have beneficial effects on immunity and may have gastro-protective effects
- May protect against the development of such diabetic complications as cataracts, retinopathy, neuropathy and nephropathy
- May have benefit in conditions characterized by capillary fragility
- Stage I hypertension

Dietary Sources

- Onions, red wine, green tea, and St. John's wort

Dosage

- 200-1200 mg daily
- Hypertension: 700-900 mg daily

Interactions

- Quinolone antibiotics: theoretically Quercitin can serve as a competitive inhibitor to the quinolones antibiotics
- Cisplatin: Theoretical risk of genotoxicity in those using cisplatin along with Quercetin
- Nutritional supplements: Bromelain and papain may increase absorption of quercetin

Side Effects / Adverse Reactions

- Generally well tolerated.
- Adverse gastrointestinal effects include nausea, and rare reports of headache and mild tingling of the extremities
- No reports of oral overdosage

Precautions / Contraindications

- No contraindications known
- Should be avoided by pregnant women and nursing mothers

Red Yeast Rice

Biochemical Effects

- May have hypocholesterolemic and hypotriglyceridemic activities in some
- Contains HMG-CoA reductase inhibitors, affecting an early and rate limiting step in cholesterol biosynthesis
- Beta-sitosterol is known to have hypocholesterolemic activity
- Increases production of arachidonic acid
- May have anti-inflammatory properties

Indications

- High cholesterol
- High triglycerides

Dosage

- Usual dose is 1,200 mg twice daily immediately following a meal
- Always supplement with Coenzyme Q-10 and Omega-3 fish oil when using red yeast rice

Interactions

- Azole antifungals (Fluconazole, ketoconazole, Itraconazole) may increase the risk of myopathy
- Cyclosporine may increase the risk of myopathy
- Fibrates (clofibrate, fenofibrate) may increase the risk of myopathy
- Gemfibrozil may increase the risk of myopathy
- Macrolide antibiotics (clarithromycin, erythromycin) may increase the risk of myopathy
- Nefazodone may increase the risk of myopathy
- Protease inhibitors (amprenavir, indinavir, nelfinavir, ritonavir, saquinavir) may increase the risk of myopathy
- Statins (atorvastatin, cerivastatin, fluvastatin, lovastatin, prevastatin, simvastatin) may increase the risk of adverse reactions
- Warfarin may result in an increase in the INR as well as bleeding
- Nutritional Supplements
  - Nicotinic acid may increase the risk of myopathy
- Foods
  - Grapefruit juice may increase the risk of myopathy
  - Meals – when given under fasting conditions, blood levels of the active component of red yeast rice is less than when administered immediately following a meal

Side Effects/Toxicity

- Occasional flatulence and heartburn
- There are no reports of overdosage in the literature

Precautions

- Could result in elevated liver tests, elevated creatine kinase levels, myopathy and liver dysfunction
- All the warnings, precautions and interactions of pharmaceutical lovastatin apply
- Could cause myopathy, manifested as muscle pain or weakness associated with elevated levels of creatine kinase
- Rhabdomyolysis, with or without acute renal failure, has been rarely reported with statin drugs
- It is recommended that liver tests be performed before starting red yeast rice, at 6 and 12 weeks after starting its use, and periodically thereafter
- Lovastatin has been reported to lower coenzyme Q10 levels

Contraindications

- Hypersensitivity to a red yeast rice-containing preparations
- Those with active liver disease
- Pregnant and nursing mothers should avoid the use of red yeast rice

Resveratrol

Biochemical Effects

- Naturally occurring phytoalexin produced by some plants in response to injury or infection, as a defense against infection
- A polyphenol
- Inhibits oxidation of LDL cholesterol
- Inhibits smooth muscle cell proliferation
- Inhibits platelet aggregation
- Inhibits production of pro-atherogenic eicosanoids by platelets and neutrophils
- Antioxidant activity
- May have effects against ischemia-reperfusion-induced arrhythmia and mortality

- Increases nitric oxide production
- Protects against endothelial dysfunction
- Anti-mutagenic activity
- Reduces activation of nuclear factor-kappa beta (NF-kBeta)
- Increases the number and functionality of endothelial progenitor cells, crucial to blood vessel repair
- Mimics the gene expression effects of caloric restriction

Indications

- Anti-cancer effects
- Anti-atherosclerotic effects
- Anti-oxidant
- Anti-aging effects

Dietary Sources

- grape seeds, grape skins, red wine, peanuts, mulberries, some pines, and the roots and stalks of Japanese knotwood

Dosage

- Use Standardized extract
- Minimum: 20 mg daily
- 'Anti-aging' effects: 250-1000 mg daily

Interactions

- Doses > 100 mg daily
  - May increase the risk of bleeding in individuals who also use anticoagulant drugs, such as warfarin (Coumadin), or antiplatelet drugs, such as clopidogrel (Plavix)
  - Could increase the bioavailability of certain medications such as statin drugs, calcium-channel blockers, benzodiazepines, and drugs used to treat erectile dysfunction

Side Effects/Toxicity

- None reported

Contraindications

- Hypersensitivity to resveratrol-containing products
- Should be avoided in pregnant women and nursing mothers

S-Adenosyl-L-Methionine (SAMe)

Biochemical Effects

- A natural substance in the cells of the body
- A direct metabolite of L-methionine
- Plays a crucial role in transmethylation. Methylation of DNA is critical in the biological phenomenon known as gene silencing, which helps suppress genes that give rise to cancer
- Is the methyl donor for the synthesis of epinephrine, creatine, melatonin, glutathione, L-cysteine and taurine
- May have anti-depressant and hepatoprotective activities

Indications

- Promotion and support of mood and emotional well-being
- For the treatment of depression
- Support of joint health, mobility and joint comfort
- Some liver conditions including various forms of cirrhosis and cholestatis
- May be useful in lowering lipids

Dietary Sources

- N/A

Dosage

- Take on an empty stomach
- Depression: 400-1600 mg daily in divided doses
- Liver problems: up to 1600 mg daily in divided doses
- Bone health: 200-1200 mg daily in divided doses

- Doses may be reduced by up to half when a positive effect is achieved
- Take SAMe with supplemental B6, B12, folic acid, and possibly trimethylglycine

Interactions

- No reported adverse interactions

Side Effects / Adverse Reactions

- No reported serious adverse effects
- Adverse gastrointestinal effects include stomach pain, nausea, diarrhea and flatulence
- No overdosage reported

Precautions / Contraindications

- No contraindications known
- Sufferers of bipolar depression should not use SAMe unless under medical supervision
- Those who are taking antidepressants should consult with their physician before taking SAMe
- Should be avoided by those undergoing gene therapy
- Should be avoided by pregnant women and nursing mothers

Saw Palmetto (Serenoa repens)

Biochemical Effects

- Has been shown to inhibit 5-alpha-reductase and to have an inhibitory effect on the binding of DHT to androgen receptors in the prostate
- Has also been shown to have anti-inflammatory effects and to inhibit prolactin and growth factor induced prostate cell proliferation
- Acts as an alpha-adrenergic receptor inhibitor, reducing urinary urgency and inflammatory action in the prostate gland

Indications

- Inhibits production of dihydrotestosterone (DHT), a form of testosterone that contributes to enlargement of the prostate
- May also enhance sexual functioning and sexual desire
- Increases sperm production, breast size, and sexual vigor
- May also act as a mild diuretic

Dosage

- 160mg twice daily (containing at least 85-95% fatty acids and 0.2% sterols)

Interactions

- None reported

Side Effects /Toxicity

- No significant side effects have been reported in the clinical trials with saw palmetto berry extract and ingestion
- Few reported side effects include abdominal pain, back pain, constipation, diarrhea, headache, and decreased libido

Precautions / Contraindications

- Contraindicated in pregnancy and in women of child-bearing years
- Use with caution in conditions other than BPH because of lack of data with respect to its effects

Selenium

Biochemical Effects

- Selenium is an essential trace element in the human body
- It is a component of antioxidant enzymes which protects the cells against free radical damage
- Enhances vitamin E function
- Improves the production of sperm and sperm motility
- It is an important co-factor in the normal functioning of the immune system and thyroid gland

Indications

- Anyone relying on TPN as the only source of nutrition
- For supplementation for patients with GI disorders which can impair selenium absorption, such as Crohn's disease

- Selenium may be effective in preventing and treating cancers such as lung, colorectal, prostate, and non-melanoma skin cancer
- Selenium may help to prevent coronary artery disease due to its antioxidant effect
- Selenium may help to relieve symptoms of inflammatory arthritis (RA) due to antioxidant effects
- May help prevent diabetes
- Selenium may be important in HIV disease because of its effects on the immune system and its action as an antioxidant

Dietary Sources

- Organ meats (liver, kidney), oysters, tuna, herring, whole grains, nuts, brewer's yeast, wheat germ and vegetables. The amount of selenium in vegetables depends on the selenium content of the soil

Dosage

- Suggested range is 50-200 mcg/day for adults
- Should not exceed 400 mcg/day in order to prevent selenosis

Interactions

- Vitamin C can decrease the absorption of selenium

Side effects/Toxicity

- Excess selenium can cause problems with strength of teeth and the tooth enamel
- Other problems may include loss of teeth, hair, and nails, as well as skin inflammation, nausea, and fatigue

Contraindications

- Seborrheic dermatitis
- Dandruff with inflammation

Soy Isoflavones

Biochemical Effects

- Phytoestrogens found in soybeans. Phytoestrogens are plant-derived nonsteroidal compounds that possess estrogen-like biological activity
- Have both weak estrogenic and anti-estrogenic effects
- The three main isoflavones are the aglycones genistein, daidzein and glycitein
- May have antioxidant activity
- May have anticarcinogenic activity
- May have anti-atherogenic activity
- May have hypolipidemic activity
- May have anti-osteoporotic activity
- Inhibition of aromatase activity and stimulation of sex hormone binding globulin

Indications

- Prevention and treatment of some forms of heart disease
- May aid in lowering cholesterol levels
- Prevention and treatment of some forms of cancer, especially breast, lung, prostate and leukemia
- May ameliorate some menopausal symptoms
- May be beneficial in preventing osteoporosis

Dietary Sources

- Soy products

Dosage

- 125 mg daily (provides 50 mg of soy isoflavones in a standardized extract supplement)

Interactions

- None reported

Side Effects/Toxicity

- There are no reports of overdosage

Contraindications

- Those hypersensitive to any component of the preparation
- Women with estrogen receptor-positive tumors should exercise caution

- Men with prostate cancer should discuss advisability of the use of soy isoflavones with their physician
- Soy isoflavone intake has been associated with hypothyroidism in some

Soy Protein

Biochemical Effects

- May have lipid-lowering, Antiatherogenic, antioxidant, anticarcinogenic and anti-osteoporotic activities
- Most soy protein products contain the isoflavones genistein, daidzin and glycitin, which have weak estrogenic effects and also may have antiestrogenic activity

Indications

- Reduction of risk for heart disease
- For antioxidant activity
- Reduction of total cholesterol, LDL-cholesterol, and triglycerides
- Complete protein source
- To prevent osteoporosis

Dietary Sources

- Soy products

Dosage

- A total intake of 25-50 grams of soy protein and 50 mg of soy isoflavones daily

Interactions

- May bind with certain minerals, such as calcium, magnesium, manganese, zinc, copper and iron, reducing their activity

Side Effects/Toxicity

- There are no reports of overdosage

Contraindications

- Those hypersensitive to any component of the preparation
- Women with estrogen receptor-positive tumors should exercise caution

Stinging Nettle Root (Urtica dioica)

Biochemical Effects

- Mild diuretic effect
- Mild analgesic activity
- Antiarthritic effect
- Anti-inflammatory effect
- Increases urinary flow
- Inhibits binding of sex hormone-binding globulin (SHBG) to prostate receptors
- Inhibits binding of estrogen to prostate receptors
- Interacts with binding of DHT to cytosolic and nuclear receptors

Indications

- Prostate complaints
- Relieve symptoms of benign prostatic hypertrophy
- Irritable bladder

Dosage

- Dry extract 120 mg twice daily
- Maximum dose is 600 mg daily

Interactions

- Diclofenac: Concomitant use may enhance the anti-inflammatory effects of diclofenac

Side effects/Toxicity

- No known health hazards are known with proper dosages
- Occasional, mild gastrointestinal complaints may occur
- Possible allergic reactions (skin afflictions, edema) are rare

Contraindications

- Fluid retention resulting from reduced cardiac or renal function

Trimethylglycine (Betaine)

Biochemical Effects

- Facilitates methylation metabolism, which lowers homocysteine, produces SAMe (S-adenosylmtehionine), and protects integrity of DNA
- Can prevent or reverse fatty degeneration of the liver
- May protect the liver against hepatotoxins ethanol and carbon tetrachloride
- Absorbed from the small intestines

Indications

- Homocystinuria
- Digestive aid
- May be hepatoprotective

Dosage

- 300-3000 mg daily following a meal
- should be taken with cofactors vitamin B12 and folic acid

Interactions

- Folic acid: Concomitant use may be additive with regard to the possible lowering of serum homocysteine levels

Side Effects/Toxicity

- Occasional nausea, vomiting and diarrhea have been reported
- There are no reports of betaine overdosage in the literature

Contraindications

- Hypersensitivity to a betaine-containing preparations
- Pregnant and nursing mothers should avoid the use of betaine
- Those with gastritis, gastroesophageal reflux disease (GERD) or peptic ulcer disease should avoid the use of betaine

Vitamin A (Retinol)

Biochemical Effects

- May prevent loss of vision or restore lost vision
- May have anticarcinogenic, immunomodulatory and antioxidant activities
- Stimulates growth hormone production
- Helps in the formation and maintenance of healthy teeth, skeletal and soft tissue, mucous membranes and skin
- Generates pigments in the retina

Indications and Usage

- Boost immune system. Has many positive effects in the immune system and may have some anti-cancer effects
- May help with some skin conditions and may be useful in some with Sorsby's fundus dystrophy

Dietary Sources

- Animal sources such as eggs, milk, cheese, cream, meat, liver, kidney, cod and halibut fish oil

Dosage

- 2500-5000 IU daily
- Supplemental doses greater than 10,000 IU daily are not recommended

Interactions

- Cholestyramine: concomitant intake may reduce the absorption of vitamin A
- Colestipol: Concomitant intake may reduce the absorption of vitamin A
- Mineral Oil: Concomitant intake may reduce absorption of vitamin A
- Oral Contraceptives: May increase serum retinol
- Orlistat: May decrease the absorption of vitamin A
- Retinoid Drugs: Supplemental vitamin A may add to the toxicity of these drugs
- Vitamin K: Large doses of vitamin A may decrease the absorption of vitamin K

- Olestra: Inhibits the absorption of vitamin A

Side Effects /Toxicity

- May cause acute or chronic toxicity – dry rough skin, cracked lips, sparse coarse hair and alopecia of the eyebrows, irritability, headache, pseudotumor cerebri, elevated serum liver enzymes, reversible non-cirrhotic portal hypertension, hepatic fibrosis and cirrhosis.
- Too much (or too little) may increase risk for osteoporosis

Precautions / Contraindications

- Contraindicated above 5,000 IU in pregnancy and nursing mothers
- Contraindicated in those hypersensitive to any component of a vitamin A-containing product
- Contraindicated in hypervitaminosis A
- Supplemental vitamin A may add to the toxicity of retinoids or retinoid analogues which are used pharmaceutically. These include acitretin, all-trans-retinoic acid, bexarotene, etretinate and isotretinoin

Vitamin B1 (Thiamin)

Biochemical Effects

- May have antioxidant, erythropoietic, cognition-and mood-modulatory, antiatherosclerotic and detoxification activities
- Used as a cofactor for energy metabolism
- Has putative ergogenic activity

Indications and Usage

- Supplementation in frank and marginal thiamin deficiency among alcoholics, the elderly and the chronically ill
- In diabetics it may increase glucose tolerance and may help prevent atherosclerosis
- Congestive heart failure under certain circumstances
- May improve mood and cognition in some
- May promote tumor-cell proliferation in cancer patients

Dietary Sources

- Kidney, salmon, liver, beans, yeast and vegetables

Dosage

- 100 mg daily

Interactions

- Loop Diuretics (furosemide, ethacrynic acid, bumetanide): Chronic use may result in thiamin deficiency
- Sulfites: may inactivate thiamin
- Tea, coffee, and Decaffeinated coffee: may inactivate thiamin

Side Effects /Toxicity

- Well tolerated at doses up to 200 mg daily.
- Overdose has not been reported

Precautions / Contraindications

- Contraindicated in those hypersensitive to any component of a Thiamin-containing product
- Pregnant and nursing mothers should avoid intake greater than 3 mg daily unless prescribed by their physician

Vitamin B2 (Riboflavin)

Biochemical Effects

- Has antioxidant activity
- May have activity in the prophylaxis of migraine headaches and may have activity against esophageal cancer
- Has putative anti-atherosclerotic activity and putative antimalarial activity
- Gives urine a bright yellow color when taken as a supplement

Indications and Usage

- Effective migraine prophylaxis in some

- Significant antioxidant-promoting activity which protects against cardiac injury produced by reperfusion following ischemia
- Inhibits lipid oxidation
- Exhibits some activity against esophageal cancer

Dietary Sources

- Liver, kidney, beans, egg yolk and yeast

Dosage

- 100 mg daily
- Up to 400 mg daily in divided doses for migraine prophylaxis

Interactions

- Cholestyramine: Concomitant intake may reduce the absorption of riboflavin
- Chlorpromazine: May inhibit the conversion of riboflavin to FMN and FAD
- Colestipol: Concomitant intake may reduce the absorption of riboflavin
- Doxorubicin: May inhibit the conversion of riboflavin to FMN and FAD
- Metoclopramide: May decrease the absorption of riboflavin
- Oral Contraceptives: May decrease serum riboflavin levels
- Probenecid: May inhibit the absorption or renal tubular secretion of riboflavin
- Propantheline bromine: May enhance absorption of riboflavin
- Quinacrine: May inhibit the conversion of riboflavin to FMN and FAD
- Tricyclic Antidepressants (amitriptyline, imipramine): May inhibit conversion of riboflavin to FMN and FAD
- Boron: May induce riboflavin deficiency
- Psyllium: Concomitant intake may decrease the absorption of riboflavin
- Vitamin E: Riboflavin may potentiate the antioxidant effect of Vitamin E

Side Effects /Toxicity

- Well tolerated
- Doses of 400 mg daily may cause diarrhea and polyuria.
- Overdose has not been reported
- Imparts a yellow-orange discoloration to urine

Precautions / Contraindications

- Contraindicated in those hypersensitive to any component of a Riboflavin-containing product
- Pregnant and nursing mothers should avoid intake greater than 3 mg daily unless prescribed by their physician
- Riboflavin absorption is increased in hypothyroidism and decreased in hyperthyroidism

Vitamin B6 (Pyridoxine)

Biochemical Effects

- Aids in maintaining sodium and potassium balance
- Involved in the synthesis and transformation of amino acids
- Involved in the production of red blood cells, immune cells and neurotransmitters
- Required for the chemical reactions involving proteins. The higher the protein intake, the greater the need for vitamin B6
- It is a partner of folate and b12 in numerous processes
- Needed for normal brain function and for the synthesis of the nucleic acids RNA and DNA
- Plays a role in cancer immunity and aids in the prevention of arteriosclerosis. It inhibits the formation of a toxic chemical called homocysteine, which attacks the heart muscle and allows the deposition of cholesterol around the heart muscle

Indications

- Vitamin B6 deficiency
- Prophylaxis of isoniazid-induced peripheral neuropathy
- May be useful for treating premenstrual syndrome (PMS)
- May protect against atherosclerosis
- May be useful for activity against melanoma

- May stimulate the immune system

Dietary Sources

- Poultry, pork, eggs, liver, kidney, beans, legumes, whole grains, spinach, carrots, peas, walnuts, sunflower seeds and wheat germ, bananas, pears

Dosage

- Usual dose: 50-100 mg daily
- Dose range: 10-200mg daily

Interactions

- Carbamazepine, cycloserine, ethionamide, fosphenytoin, hydralazine, isoniazid, oral contraceptives, penacillamine, valproic acid and chronic and excessive use of alcoholic beverages can result in the need for vitamin B6
- Concomitant use may lower levels of phenobarbital, phenytoin and levodopa

Side Effects / Adverse Reactions

- Nausea, vomiting, abdominal pain, loss of appetite and breast soreness with high doses.
- Rare cases of pyridoxine-induced photosensitivity have been reported
- Sensory neuropathy

Precautions / Contraindications

- those who are being treated with levodopa without concurrently taking carbidopa should avoid doses of vitamin B6 of 5 mg or greater daily

Vitamin B12 (Cyanocobalamin, Dibencoide & Methylcobalamin)

Biochemical Effects

- Used in the treatment of B12 deficiency states, including megaloblastic anemia
- Important for cell growth and for the formation of red blood cells
- Important for the maintenance of the central nervous system
- Participates with folate in numerous metabolic processes
- May have Antiatherogenic, neuroprotective, anticarcinogenic and detoxifying activities
- Has putative anti-allergic and mood-modulatory activities

Indications and Usage

- B12 deficiency
- Elderly and for those who have had gastric surgery
- May be beneficial in the chronically ill as well as some vegetarians
- May be helpful in inhibiting a pre-cancerous condition in the lungs of smokers
- Might ameliorate the symptoms of some neuropsychiatric disorders
- May be useful in chronic fatigue syndrome and HIV disease
- May help prevent some vascular diseases and breast cancer
- May protect against hypersensitivity to sulfites

Dietary Sources

- Liver, kidney, red meat, poultry, fish, eggs and dairy products
- Vegan sources include yeast extracts and soy products

Dosage

- 400 – 1000 mcg daily
- 10-30% of individuals over age 50 have low stomach acid secretion and may have decreased bioavailability of vitamin B12 from food. In these cases, methylcobalamin lozenges may be more efficatious than cyanocobalamin

Interactions

- Antibiotics: May alter intestinal microflora and may decrease the possible contribution of B12 by certain inhabitants of microflora to the body's requirements for the vitamin. This may particularly be a problem for vegetarians. Garlic, onions, leeks, bananas, asparagus and artichokes, among other vegetables and fruits, contain inulins which promote growth of certain colonic bacteria, including Lactobacillus species
- Cholestyramine: May decrease the enterohepatic reabsorption of B12
- Colchicine: May cause decreased absorption of B12

- Colestipol: May decrease the enterohepatic reabsorption of B12
- H_2 Blockers (cimetidine, famotidine, nizatidine, ranitidine): Chronic use may decrease absorption of vitamin B12 naturally found in food sources, but not supplemental vitamin B12
- Metformin: May decrease the absorption of vitamin B12. This effect may be reversed with oral calcium supplementation
- Pare-aminosalicylic acid: Chronic use of the anti-tuberculosis drug may decrease absorption of vitamin B12
- Potassium Chloride: May decrease the absorption of dietary B12 in some
- Proton Pump Inhibitors (lansoprazole, omeprazole, pantoprazole, rabeprazole): Chronic use may result in decreased absorption of vitamin B12 naturally found in food sources, but not supplemental vitamin B12
- Folate: May work synergistically with vitamin B12 in lowering Homocysteine levels
- Vitamin B6: may work synergistically with vitamin B12 and folate in lowering homocysteine levels

Side Effects /Toxicity

- Well tolerated
- Occasional hypersensitivity reactions (urticaria, rash, pruritis) with parental B12.
- Overdose has not been reported

Precautions / Contraindications

- Contraindicated in those hypersensitive to any component of a vitamin B12-containing product
- Pregnant and nursing mothers should avoid intake greater than 12 mcg daily unless prescribed by their physician
- Should not be used in those with Leber's optic atrophy, a congenital disorder associated with chronic cyanide intoxication (e.g., from tobacco smoke)
- May produce a hematological response in those with anemia secondary to folate deficiency

Vitamin C (Ascorbic acid)

Biochemical Effects

- Antioxidant activity
- Important for the formation of teeth, bone and cartilage
- Important for healthy gums and for immunity
- Promotes tissue healing and tissue integrity
- Enhances immune function and protects against harmful effects of pollution

Indications

- Acute viral infections
- Bacterial infections
- Cancer
- Prevention of rheumatoid arthritis
- Low HDL cholesterol

Dietary Sources

- Citrus fruits, kiwi, guavas, strawberries, tomatoes, green peppers and alfalfa sprouts

Dosage

- 2,000 mg daily
- The dosage range is 200-5,000 mg daily

Interactions

- Tobacco smoke causes depletion of vitamin C
- Alcohol, analgesics, antidepressants, anticoagulants, oral contraceptives, and steroids may reduce levels of vitamin C
- Chronic use of high dose aspirin may lead to impaired vitamin C status
- May enhance 17 beta-estradiol inhibition of oxidized LDL formation
- Concomitant use with aluminum-containing antacids may increase urinary aluminum excretion
- May act synergistically with flavonoids
- May help maintain reduced glutathione levels in cells
- Concomitant use with nonheme iron supplements may increase the uptake of iron

- Vitamin C may regenerate or spare d-alpha-tocopherol
- High doses of vitamin C may compete with or interfere with copper absorption
- Intake greater than 1 gm daily may cause false negative guaiac test

Side Effects / Toxicity

- Abdominal pain and diarrhea occur with higher doses
- Individuals with a genetic defect in oxalate metabolism may be at increased risk of developing kidney stones with high doses of vitamin C
- There are no reports of overdosage

Contraindications

- Hypersensitivity to the substance or to any ingredient in a vitamin C-containing product
- Rose hip vitamin C is contraindicated in those with known hypersensitivity to rose hips
- Pregnant women and nursing mothers should avoid using supplemental vitamin C higher than RDA amounts
- Those with hemochromatosis, thalassemia, sideroblastic anemia, sickle cell anemia and erythrocyte G6PD deficiency might have a problem with iron overload if they use large amounts of vitamin C

Vitamin D (Cholecalciferol)

Biochemical Effects

- The main function of vitamin D, a fat soluble vitamin, is to maintain normal blood levels of calcium and phosphorus by aiding in the absorption of calcium
- It promotes mineralization and prevents rickets in children and osteomalacia in adults
- Vitamin D is also important in maintaining normal clotting, a stable nervous system, and in the proper functioning of muscles, cell growth, and energy utilization
- Deficiency is associated with increased incidence of cancer of the prostate, colon, breast and ovary

Indications

- People who may need vitamin D supplementation include older patients (>50 years old), patients with limited sun exposure, patients with conditions which decrease their ability to absorb dietary fat
- Osteoporosis prevention
- Cancer prevention – breast, colon, lung, prostate
- Diabetes (treatment and prevention)
- Hypertension
- Multiple sclerosis
- Congestive heart failure
- Long-term corticosteroid use
- Alzheimer's
- Autoimmune diseases
- Psoriasis

Dietary Sources

- Fortified foods are the major dietary sources. The richest natural source is milk, followed by fish oils and fatty fish, such as sardines, tuna, pilchards, mackerel and herring

Dosage

- Recommended intake is at least 1000-2000 IU/day for most adults.
- For osteoporosis, 2000-4000 IU/day may be required. Consult with your physician prior to doses greater than 2000 IU daily if you are prone to kidney stones
- Studies show safe limits of up to 10,000 IU/day
- For deficiency state (verified by low 25-alpha-hydroxy Vitamin D level): Rx 50,000 IU (e.g., Drisdol capsules) once per week for 4-8 weeks, followed by repeat blood level

Interactions

- Phenytoin and Phenobarbital can decrease the effect of vitamin D
- Antacids with aluminum, anticonvulsants, barbiturates, cholestyramine, colestipol, hydantoin,

primidone can decrease the effectiveness of vitamin D
- Vitamin D can reduce the effect of calcitonin
- Vitamin D can increase the risk of arrhythmias when used with digitalis; also when vitamin D is taken with high doses of calcium or thiazide diuretics

Side Effects/Toxicity

- Anorexia, constipation, diarrhea, dry mouth, headache, increased thirst, mental confusion, metallic taste, nausea, unusual tiredness, vomiting

Contraindications

- Consult physician if you have blood vessel diseases, intestinal problems, kidney disease, liver disease, pancreatic disease, sarcoidosis

Vitamin E (Tocopherols)

Biochemical Effects

- Antioxidant — Prevents cell damage by inhibiting the oxidation of lipids (fats) and the formation of free radicals
- Important for the formation of red blood cells and the use of vitamin K
- Anti-cholesterolemic actions
- Anti-atherogenic actions, by inhibiting oxidation of LDL cholesterol
- Anti-thrombotic actions
- Anti-carcinogenic actions (e.g., inhibit prostate, breast and colon cancer, etc.)
- Anti-viral actions
- Prevention of cardiovascular disease
- Enhances immune function
- Neuroprotective actions
- Cell membrane stabilizing actions
- Vitamin E consists of several forms of tocopherol: alpha, beta, gamma, and delta

Indications

- Cardiovascular disease
- Autoimmune disease
- Fibrocystic breast disease
- May be helpful in some neurological diseases (including Alzheimer's disease)
- May be helpful in some eye disorders (particularly cataracts)
- May be helpful in diabetics
- May be helpful in metabolic syndrome
- May lower cholesterol
- May alleviate women's hot flashes and lessen vaginal thinning and dryness

Dietary Sources

- Wheat germ, corn, nuts, seeds, olives, spinach, asparagus and other green leafy vegetables, vegetable oils (corn, sunflower, soybean and cottonseed) and products made from vegetable oils such as margarine

Dosage

- The dosage range is 100-1000 IU daily
- Use only mixed natural tocopherols, that contain the four vitamin E isomers in proportions that are similar to those found in the diet
- Supplements containing only the alpha tocopherol (dl-alpha-tocopherol is synthetic, and d-alpha-tocopherol is natural) will deplete the brain of needed gamma tocopherol, which could increase the risk for brain hemorrhage. It may also deplete the liver of delta tocopherol, which could lead to abnormal elevation of liver enzymes

Interactions

- Inorganic forms of iron (i.e. Ferrous sulfate) destroy vitamin E
- An early report suggesting that vitamin E increases the bleeding tendency in patients on warfarin has been refuted. Those on warfarin should consult their physician if they use high doses of

vitamin E.
- Amiodarone: Vitamin E may ameliorate some of the adverse side effects of this drug.
- Anticonvulsants such as Phenobarbital, phenytoin and carbamazepine: may lower vitamin E levels
- Antiplatelet drugs such as aspirin, dipyridamole, eptifibatide, clopidogrel, ticlopidine HCI tirofiban and abceximab: high doses of vitamin E may potentiate the antiplatelet effects
- Cholestyramine: may decrease vitamin E absorption
- Colestipol: may decrease vitamin E absorption
- Cyclosporine: Vitamin E may help ameliorate the renal side effects
- Isoniazid: may decrease vitamin E absorption
- Mineral oil: may decrease vitamin E absorption
- Multidrug-resistance (MDR) modifying agents: Vitamin E may antagonize the MDR-modifying activity of the chemosensitizing agents cyclosporine A, verapamil, clofazimine, GF120918 and B669 to both doxorubicin and vinblastine
- Neomycin: may impair utilization of vitamin E
- Orlistat: inhibits vitamin E absorption
- Sucralfate: interferes with vitamin E absorption
- Zidovudine: vitamin E may ameliorate myelosuppressive side effects of zidovudine
- Desiccated ox bile: may increase the absorption of vitamin E
- Dietary fiber: may decrease the Antioxidative effect of vitamin E supplements
- Medium-chain triglycerides: if taken concomitantly with vitamin E may enhance its absorption
- Phytosterols and phytostanols, including beta-sitosterol and beta-sitostanol: may lower plasma vitamin E levels
- Plant phenolic compounds and flavonoids: help maintain levels of reduced vitamin E
- Polyunsaturated fatty acids (PUFAs), including alpha-linolenic acid and gamma-linolenic acid: may increase vitamin E requirements
- Selenium: may function synergistically with vitamin E
- Vitamin C: may spare vitamin E
- Dietary polyunsaturated fat: should be accompanied y increased vitamin E intake to prevent their oxidation
- Olestra: inhibits vitamin E absorption
- Herbs (garlic, ginkgo): high doses of vitamin E at the same time as these herbs may enhance their antithrombotic activity.

Side Effects / Toxicity

- Adverse reactions include fatigue, breast soreness, emotional disturbances, thrombophlebitis, retinuria, gastrointestinal disturbances, altered serum lipid levels and thyroid problems. These adverse reactions are rare and none have been reported in controlled studies.
- No significant toxicity has been reported. However, long-term safety of high doses has not been studied.

Vitamin K

Biochemical Effects

- Has hemostatic activity
- May have anti-osteoporotic, antioxidant and anticarcinogenic activities
- Low levels enable calcium to be deposited into atherosclerotic lesions

Indications and Usage

- Vitamin K deficiency
- Some malabsorption syndromes
- Some on long-term total parental nutrition
- May help protect against osteoporosis generally
- May have some anti-atherosclerotic effects

Dietary Sources

- Vitamin K_1
  - Green leafy vegetables

- Vegetable oils – olive oil, canola oil, soybean oil and cottonseed oil
- Vitamin K_2
  - Egg yolk, butter, cow liver, certain cheeses and fermented soybean products

Dosage

- Usual dose: Females - 90 mcg daily; Males – 120 mcg daily
- Dosage range is 25 mcg – 10 mg daily
- Osteoporosis: 1 mg vitamin K2 1-2 times daily and 9 mg vitamin K1 daily

Interactions

- Broad-Spectrum Antibiotics: May sterilize the bowel and decrease the vitamin K contribution to the body by the intestinal microflora
- Cephalosporins: May cause vitamin K deficiency and hypoprothrombinemia
- Cholestyramine: concomitant use may the absorption of vitamin K
- Colestipol: Concomitant use may reduce the absorption of vitamin K
- Mineral Oil: Concomitant intake may reduce absorption of vitamin K
- Orlistat: May decrease the absorption of vitamin K
- Salicylates: In large doses may result in vitamin K deficiency
- Warfarin: Vitamin K can antagonize the effect of warfarin
- Medium Chain Triglycerides: Concomitant intake may enhance the absorption of vitamin K
- Squalene: Concomitant intake may decrease the absorption of vitamin K
- Vitamin A: High doses may decrease the absorption of vitamin K
- Vitamin E: Very large doses may result in vitamin K deficiency
- Olestra: Inhibits absorption of vitamin K as well as the other fat-soluble vitamins A, D, and E

Side Effects /Toxicity

- Well tolerated

Precautions / Contraindications

- Contraindicated in those hypersensitive to any component of a vitamin K-containing product
- Pregnant and nursing mothers should avoid intake greater than 65 mcg daily unless prescribed by their physician
- Those taking warfarin should avoid supplementation with vitamin K unless specifically prescribed by their physician

Zinc

Biochemical Effects

- Zinc is necessary for immune function, protein synthesis, digestion, skin integrity, and cell growth
- It is also required for the activity of the antioxidant enzyme superoxide dismutase (SOD)
- Zinc is involved with the enzymes that regulate the functioning of DNA. Dementia is thought to result from disturbances in these enzymes and DNA cells, and it is therefore thought that zinc may be beneficial in Alzheimer's patients
- Supplementation of zinc has led to improvement in memory, comprehension, communication, and social interactions
- Zinc is important in male sex hormone and prostate function and also important during pregnancy
- Zinc also helps to increase resistance to infection and tumor growth; when combined with vitamin A, zinc will help a suppressed immune system recover

Indications

- Functions as an antioxidant
- Promotes normal growth and development
- Aids in wound healing
- May also relieve angina, boost immunity and cure cold symptoms
- Prevent cancer
- Increase testosterone levels in men
- Protection against macular degeneration
- arthritis

Dietary Sources

• Meat, liver, eggs, seafood (oysters), vegetables
Dosage
• Optimal range 15-30 mg/day; Range: up to 100 mg daily • Doses greater than 60 mg/day – consult with your physician
Interactions
• Zinc interferes with calcium absorption • Decreases copper and iron absorption • Can also decrease the absorption of tetracycline • Diuretics may increase the excretion of zinc
Side Effects/Toxicity
• Abdominal pain, abnormal bleeding, gastric ulcer, mild diarrhea, nausea, and vomiting • Overdose causes drowsiness, lethargy, lightheadedness, motor disturbances, and excessive vomiting
Contraindications
• Ask doctor about zinc supplementation in pregnancy and breast feeding; do not take mega-doses; do not take if gastric or duodenal ulcers are present

NOTES

NOTES

Optimal Stress-Response Management for Living Younger

"Growth is the only evidence of life" – Cardinal Newman

The "stress response" has been part of life for at least 700 million years, DNA research shows. When a threat is perceived, the endocrine system is powered up. Muscles tense, breathing and heart rate speed up, blood pressure increases, and various hormones are released to produce energy, such as cortisol and adrenaline. All these changes are part of the "fight or flight" response, useful for escaping predators or dealing with life-or-death situations.

In most modern situations, however, where neither flight or fight responses are particularly necessary, there is no appropriate way for the release of the built-up energy after a highly stressful event. If this situation occurs often enough or chronically, it has a negative impact on overall health and well-being – reduced immune response, high blood pressure, silent inflammation, cognitive decline, hormonal imbalances, heart attacks and strokes. Furthermore, chronic stress promotes unhealthy lifestyles, such as drug and alcohol abuse or overeating and underactivity.

Apart from the creating the "flight or fight response", is there any potential health benefit to stress? Is it possible to have too little stress in life? The answer is yes to both questions.

When muscles are exposed to too little stress, they will atrophy. Too much stress and they become damaged. Yet with stress applied to muscles in the right volume and intensity, they become stronger. Stress, when managed properly, is actually the only means by which muscles can become healthy and fit. The key to successful strength building is in finding a balance between stress and recovery. Successful healthy aging depends on achieving a similar balance between stress and recovery – in every aspect of life. The only way to survive – and grow – in today's world is not to get rid of stress but to improve your ability to use and manage stress.

Muscle growth can only occur in response to real physical stress. Imagined physical stress does not build greater physical strength. Unlike muscles, however, the mind does not differentiate between real and perceived stress. The final impact is the same either way. The result can be either growthful or damaging. Stress, real or perceived, creates the same physiologic response, the release of a cascade of hormones and neuropeptides into the body.

The primary hormone of stress is cortisol. Cortisol is necessary for survival; the ability to muster an immediate release of cortisol and adrenaline in life-threatening situations. Survival for our early ancestors was completely dependent upon a rapid and intense response to danger. They faced very real threats – attacks from predators, famine and starvation, or environmental risks of trauma, infection and climate extremes. For them an immediate and strong 'fight-or-flight' stress response was often truly a life or death

proposition. Furthermore, cortisol can increase appetite, boost energy levels, improve digestion, and enhance the immune system – when elevated for short intervals. Unlike our early ancestors, most modern human conditions lack the same frequency and intensity of stressors. It is more likely that the biggest threat most of us face regularly is something on the order of preparing for a boardroom presentation or getting the kids to soccer practice on time. Even these relatively minor stressors may generate just as intense of a stress response compared to those faced with an oncoming saber-toothed tiger. Our evolutionary need for a powerful stress response too often works against us today. A stress response kicks in, but is it truly necessary for survival? Too much stress – too much cortisol – and we become damaged. Most hormones decline but unfortunately, cortisol is one of few hormones, like insulin, to increase gradually with age. Mean cortisol levels increase by 20-50% between 20 to 80 years of age. Prolonged elevations of cortisol will accelerate the aging processes, such as free radical production and shortening of DNA telomeres. Elevated levels suppress thyroid T3 levels, increase insulin levels, inhibit eicosanoid production, and cause death to cortisol-sensitive cells in the thymus and hippocampus portions of the brain. Chronic exposure to high levels puts us at increased risk for aging-related diseases: coronary heart disease, diabetes, hypertension, osteoporosis, Alzheimer's disease.

It is possible, and desirable, to develop the means to change your reaction to stressors in ways that are growthful toward better health and happiness, and reduce risks for aging-related diseases. Controlled clinical trials have shown the benefits of stress management interventions for a variety of medical conditions, including improvements in the symptoms, biological markers, or outcomes of the disease, or in immune parameters that might improve the course of the disease. A recent report from the University of California, Irvine, revealed that those who clock 51-plus hours a week are 30% more likely to have high blood pressure than those who work less than 40. Moreover, those with chronic job stress are up to five times more likely than stress-free workers to get metabolic syndrome. Chronic conditions known to benefit from stress management include:

- Anxiety
- Asthma
- Breast cancer
- Chronic pain
- Coronary artery disease
- Depression
- Diabetes type I
- Fibromyalgia
- Headache
- Hypertension
- Irritable bowel syndrome
- Multiple sclerosis
- Rheumatoid arthritis

The key is to understand the relationships among stress, hormones and emotions, and cellular responses. The idea is to approach stressors in your life like the athlete who

uses physical stress in order to build strength and endurance. The process begins with mindfulness; awareness and acceptance of what your body and mind experience during stress; what it is telling you. Then it becomes possible to choose responses consciously rather have than reactions to stressors. At the same time, cultivate performance skills (proper form and technique) to increase your capacity to handle stress. Finally, optimum growth will result from balancing the stress in your life with balanced, growthful recovery.

The Emotional Brain

The human brain has been likened to modern computer. For instance, computers have enormous capacity to store information and solve problems. Like the brain, viruses can infect them. Moreover, at times computer behavior can seem rather quirky. Unlike the human brain, computers lack awareness and feelings. In humans, awareness and emotions are interconnected. Tens of thousands of simultaneous sensory input data get processed by the brain every moment. All five or our senses – sight, sound, touch, smell, and taste – provide input around the clock. All the things you see, hear, touch, smell, and taste are nothing but different forms of energy. Everything has energy, and everything is energy. Fortunately, we are not aware of but a small fraction of this continuous information tsunami. We manage the majority of our functions automatically at a subconscious level. Imagine if you had to process everything consciously. Brain gridlock would occur instantaneously.

Only a very small amount of this massive input ever reaches a level of awareness. The way in which you become 'aware' is with emotions. The limbic system is sometimes referred to as the "emotional brain." One of the critical areas in the limbic system is the amygdala. The amygdala associates sensory data input with previous experiences (memories) and then prioritizes the input. One of the ways it does this is to create an emotion for various life experiences. Conscious experience of your internal and external world is largely emotional. Physiologically, an emotion is the release of a cascade of neuropeptides and hormones to activate various body functions and actions. The most powerful emotional events in your life establish the strongest neurological imprints and potentially have the most profound effect on your behavior. Because it is connected to nearly every area of the brain via an extensive network of neural pathways, the amygdala can set in motion any and all physiological and hormonal systems involved in that emotion. It works either in concert with or completely independent of the rational part of the human brain. In other words, emotions may be entirely irrational at times, whether or not it fits reality as judged by the rational brain. The feeling you experience is evidence that the underlying physiological mechanisms are activated.

Emotions are so deeply rooted in the physical body that they cannot be separated. The hormonal chain of events initiated by the brain, result in specific feelings associated with the emotion. However, feelings involve the entire body. Every cell in the body carries receptors for the messengers (hormones and neuropeptides) of emotion. When you laugh at a joke, the muscles in your face give you a smile and the diaphragm makes

you guffaw. Your muscles tense up and your stomach may become uneasy when you experience anger.

Of note is the fact that the emotional pathways between the brain and the body run in both directions. Massage therapists report that clients occasionally experience a strong emotion or even a déjà vu during a body massage. It is likely that the tissue stimulation during a therapeutic body massage activates the release of a sequence or group of hormonal responses associated with a previous emotional experience or emotional. In other words, your entire body holds emotional memories. The great motivational speaker and author Dale Carnegie once said, "Act enthusiastic and you will be enthusiastic." Perhaps your mother taught you to smile when you were feeling blue, as a way to improve your outlook. Said another way, you can choose to call up the physical actions connected to emotional memories and generate the release of neuropeptides and hormones associated with a desired emotion.
Think of emotions as energy. The energy of an emotion always results in some action. It does not simply disappear without an effect or result. The action is either internalized or externalized. It may build, only to release some time later. Emotional energy may result in actions that are either beneficial or harmful. Every incident involves two variables: the first being the particular emotion we experience and the second being the actions that follow. I call them variables because both can change or be changed. Free will and the opportunity to make choices are the keys to action that helps or harms. Free will and choice depend upon a state of mindfulness.

The actions we take to discharge emotional energy get directed most often by the subconscious. A significant primal function of the subconscious is to protect us, to ensure survival, by reacting to threats. This is the survival instinct. How many times have you asked yourself after an emotion-charged experience "Why did I do or say that?" Generally, we discharge emotional energy by permitting the subconscious to determine the action taken. Actions then are based largely upon the particular emotion being experienced. Actions, when directed by the subconscious, are little more than a knee-jerk reflex. In the early days of human existence, this was a good thing. Quick, subconscious, reflexive action to avoid a threatened attack from a wild predator often meant the difference between life and death. Today's threats no longer compare to being eaten by a saber-toothed tiger, or dying of starvation from famine, or facing the perils of environmental extremes. More likely, the major stressors are associated with personal and business relationships, deadlines, and other common, but not life threatening, pressures. Yet, when allowed to control our actions in these situations, the subconscious will cause us to react as though they were real threats to survival.

We all know the only constant in life is change. Change is essentially a form of loss. It means giving up something, hopefully for something better. It is also a move from the familiar to the unfamiliar, and is consequently another form of stress. Change means entering the unknown, which may generate an even more intense emotional feeling. We may be unhappy with our current lifestyle or situation, yet we do not change simply because it is familiar. In other words, no matter how bad our present circumstances or

lifestyle might be we might not change simply because the current situation is familiar, no matter how good the prospects for change may seem.

When we relegate to the subconscious the possible choices of reactions to emotions associated with relationships, change, and perceived threat, they are likely to create more distress than they relieve. It is not so much the external stressors that place our health at risk as how we interpret and react to them. It is desirable, and achievable, to restrict subconscious reactions primarily to those emotions associated with life threatening situations, and move others to the level of consciousness.

To approach the management of stress in your life like an athlete, then, does not mean getting rid of stress. Personal growth – physical, intellectual, emotional, and spiritual – requires the presence of stressors. Obviously, there are forms of stress to avoid – life threatening situations, violence and substance abuse, for example. The objective is to approach the stressors present in your life in ways that promote growth and health – through conscious and intentional choice.

Emotional Awareness – The First Step

The first approach involves awareness of the emotion itself, true awareness of how you are feeling, acknowledging its presence and reality, and recognizing the basis for having the particular emotion in connection with the event. Learning to disengage from your inclination to react subconsciously to emotional energy provides the opportunity to choose consciously a productive, or less destructive, behavioral discharge of emotional energy. Practice becoming aware of your body, as the physiological responses can clue you in to the emotion you are experiencing. Notice how you feel. This is an uncomfortable thing to do if the emotion is one of anger, hate, or fear. Step back and allow yourself to observe your emotion. Is your pulse faster? Has your breathing changed? Are your muscles tight? What do you feel in your stomach? Your feelings will tell you whether your emotional needs are satisfied.

There is yet another way to look at management of stressors. That is by choosing to summon a desired emotion in any given situation.

Emotional Accountability – Taking Ownership

People in your life can behave in ways that 'invite' you to have certain feelings. Events can make it understandable for you to have negative reactions. Nevertheless, no one can make you have feelings like worthlessness, anger, or fear. Those are all feelings you choose.

Sometimes our own self-talk keeps us from taking ownership of our feelings. Blaming others for our feelings is the most common example. We can also mimic or incorporate into our own self-dialogue what others have said (or we think they have said) about us: "You're no good," "you will never be able to accomplish it," "I don't trust you," and so on.

Understanding your emotional needs is an important part of accountability. You cannot behave responsibly with something you do not understand. Take time to become aware

of your emotional needs. A great way to go about this is by journaling your emotions. Journal writing lowers cortisol by distressing your body. At some point, it may be very helpful if you are able to put into words your emotional needs. Which ones are not being met in your life? Do you know why?

Personal SWOT Analysis – Taking Inventory

Businesses frequently conduct an evaluation, known as a SWOT analysis, to determine what to build on, what to strengthen, what to be aware of and what possibilities exist. SWOT is an acronym for Strengths, Weaknesses, Opportunities, and Threats. Conducting a person SWOT analysis is a great way to address stress in your personal life. Some evidence suggests that simply going through this kind of exercise and writing down the answers to the following questions brings as much relief as the subsequent actions you will take. Asking a close friend or your spouse to help can provide you with additional insight. Be very specific with your answers.

- Strengths. List your top two or three personality strengths. Admitting that you have strengths is not easy for some. Everyone has strengths, acquired from a lifetime of experiences. Look back on challenging times and difficult situations to see what personal strength helped you through them. Acknowledge your strengths and be proud of them. These are the qualities to build upon. Articulate how you can use them to your advantage in stressful circumstances and practice.
- Weaknesses. Even the best of us have weaknesses, often far more than we wish to think about. Limit your list to the top two or three. What personal weaknesses contributed to past disappointments and frustrations? Define how these weaknesses contribute to your difficulty in stressful situations. Addressing your identified weaknesses can become part of your personal goals or priorities. How would you like to see yourself regarding these qualities and what could you do to get there? How will you know when you have effectively addressed your weaknesses?
- Opportunities. Again, limit them to two or three. What specific opportunities do you have for your health and wellbeing? Make sure you identify opportunities that are achievable. Try to define them in measurable terms that let you know when you have achieved or fulfilled them. Your opportunities can translate into goals, if they are measurable.
- Threats. The easiest answer is to look outside yourself and see all the things that seem to threaten your happiness, but this exercise is intended to be an assessment of personal, self-created threats. Look inward and determine the primary two or three things about yourself that threaten your own happiness. Try to clearly define them and describe how they are a threat. Visualize them being eliminated or neutralized. What would that look like? How would you go about it? Define the steps you can take to address them.

After completing your personal SWOT analysis, take time to look it over before moving on to the next section. Taking a personal inventory can be difficult and uncomfortable, but when honest and candid it is often enlightening. Further, completion of this exercise will be helpful when you begin setting personal priorities for yourself.

Personal Vision and Goals – Setting Priorities

Most of us don't really have a vision for our life. The furthest we get is to imagine having a family, a house and a means of financial security. Too often, though, having these things does not bring peace of mind, happiness, wisdom, or enlightenment. Developing a personal vision answers the question of who you aspire to become rather than what you wish to accomplish or accumulate. Perhaps it is simply how you aspire to journey, rather than where you wish the journey to end. It is a question rarely asked of or by us. How many times has anyone asked you lately who you aspire to become? More likely, the question is "what do you want to do or what do you want to have?" Failing to develop a personal vision is why many people are unhappy even when to the rest of us their life looks perfect. A Sufi poet expressed it by explaining that "when worldly people don't get something, they are restless; and when they do get it, they become arrogant."

As you work on developing your personal vision statement, state succinctly what inspires you, what gives purpose to your life, what creates meaning for you, and what is the true passion in your life. Don't forget to consider what causes you the most stress in your life. When you have it written out, say it out loud. Make it a goal to be able to tell anyone who asks your personal vision statement within 1 minute. An authentic vision statement is a statement of who you already are. Actualizing a vision statement is to become yourself, but more so.

Once your personal vision statement and your personal SWOT analysis are completed, setting your personal goals will become easy. Commit your goals to writing. Make them measurable, so you will know when they have been accomplished. Then take some time to rearrange them in descending order of importance. It is all about priorities and balance. The next time you hear yourself saying "there isn't enough time in the day" to do the things you know you should or aspire to do (spend more time with your spouse or children, take more time for yourself, etc) think of that phrase as a red flag telling you that your priorities are out of balance.

Daily Commitment – Strategies for a Lifetime

This is where the rubber meets the road. It is one thing to have goals and aspirations and another to follow through. If your goals are based upon your values and authentic aspirations your chances of success are better than if you base them upon something you were told to do or you know is right intellectually but you don't also feel it in your gut.

Separate the things that are causing you stress into those you can control or change and those you cannot. For the things you have some ability to change, create a step-by-step plan of action. For the things you can't alter apply a relaxation or emotion-management method (see below).

Begin each day with a ritual of remembrance of your vision and goals. Make a personal commitment to be true to your vision and to make positive steps toward achieving your goals. Let the universe know of your vision and goals.

Consciously choosing to discharge your emotional energy through actions that are true to yourself is the best stress management tool. Recovery is equally important for developing emotional growth and strength. Here are the strategies:

- Chosen Responses
- Chosen Emotions
- Emotional Recovery

Chosen Responses

Has anyone ever said to you "Don't let your emotions get the better of you"? I don't think it is our feelings but our subconscious reaction to them that gets the better of us, more often than not.

Acknowledge the feelings you are experiencing, particularly if it is a potentially harmful feeling such as anger or fear. Try to accept the presence of this particular emotion, without passing judgment on it. If possible, it is helpful to understand why you have that emotion in this particular situation. Next, intentionally disengage from the inclination (driven by your subconscious) to act based upon the emotion. Imagine yourself stepping out of your body and observing your feelings, but do not permit your subconscious to determine your behavior. This frees you to choose how you will discharge your emotional energy. Consciously choosing means you can respond rather than react in stressful situations. An act of free will is the result of attention and intention. You pay attention to your feelings and have intention to respond to the situation. The result is growthful and diminishes the harmful effects of unconscious emotional reactions.

Emotions often lead to unfair judgments and erroneous conclusions about people's intentions. Rather, choose actions that are responses to observed behavior.

Avoid storing emotional energy internally. Do not let it accumulate and build up. Rather, address your feelings in the situation whenever circumstances permit or as soon as possible afterward. If you have a negative feeling about someone's behavior, let him or her know how you feel, in a non-threatening way. In that way, you are giving the other person a chance to learn about you and an opportunity to change their future behavior. You cannot change other people, but you can frequently change their behavior. You can only be certain of changing yourself. Changing the way you interact in stressful situations can change how you respond emotionally in the future. Furthermore, letting someone know how you feel in situations gives him or her opportunity to change their behavior toward you.

Chosen Emotion

Optimum health is more than awareness of own emotional needs but to call selectively upon specific feelings and actions, and to set aside others. It is possible to choose consciously to have a different, more desirable, emotion or feeling in any event. Greater control over the feelings you have during an event, and your subsequent emotional responses, depends upon insight into your feelings. Certain emotions, anger and fear, degrade your ability to function at your best. Additionally, disease and illness

result from feelings of anger and fear. Conversely, optimal performance and health is clearly correlated with other emotions, such as happiness, relaxation, confidence, focus, and openness. These states are not simply subjective; each of these emotions is connected directly with specific physiological responses.
The key to mobilizing a particular emotion is to somehow turn on, in the amygdala, the memory cells that hold the physiological signature for the emotion. Of considerable importance is the fact that the memory cells of the amygdala are surprisingly accessible. One way to turn on the physiology is through sensory stimulation because the five senses provide a direct route to the amygdala.

Emotionally, the mind does not distinguish real-life occurrences from memories of past events, visualizations of emotional events, or simulated experiences (live theatre, movies, reading, etc). Equally powerful emotions may be elicited by any of these triggers. Acting means intentionally moving your feelings and physiology in targeted emotional directions. In order to trigger intentionally an emotion you can call upon a form of imagery, 'sensory memory,' and by acting with your body. Combining the two can be very effective.

- Sensory Memory
  Recall a thought or image from your life experiences that is loaded with the strong emotion that you wish to summon (e.g., happiness or sadness), and then intensely focus on it, accepting the emotion to develop.

- Targeted Acting with your Body
  Mimicking the physical body movements (posture, facial expression, and so on) consistent with a particular emotion may reproduce the actual emotion. Take on the physical look you would have with the desired emotion. Simply moving facial muscles in the direction of fear, anger, disgust, sadness, surprise, or happiness actually causes autonomic nervous system reactors to move in the direction of the respective emotion. With this method, cells of the amygdala turn off and on in response to changing patterns of muscle movement.

During a stressful moment (real, imagined, remembered) faking a desired emotional response may be better than simply going with whatever suboptimal emotions might be stirring at the time, but you won't genuinely empower yourself or others until you achieve your desired hormonal response. 'Fake it until you make it.'

Changing Emotions through Affirmations
It is possible to alter your unhealthy attitudes, beliefs and responses to stressful situations using the approach discussed above. Changing first how you feel about something can change your attitude. Conversely, changing your attitude can change how you feel. Awareness of your current beliefs that are blocking your path (e.g., I hate giving…, I hate doing…, I'll never get comfortable with…, I hate my…, I cannot work with…, etc) is the first step. The next step is to reverse your thinking process from "I hate _____" to "I want to _____."

Prevention involves planning and preparation. Preventing undesirable emotional responses to stressful situations requires mental preparation and practice. Practice seeing images of yourself staying calm and relaxed under fire. Practice this form of imaging when you know you will be engaging in a specific stressful circumstance. The following training sequence has proven effective in controlling the occurrence of negative thinking:

1. Increase your personal awareness to the point that, as soon as your thinking turns negative and nonproductive, an alarm goes off inside your head.
2. Say "Stop" to the negative or nonproductive thoughts
3. Immediately replace any negative thoughts with realistic positive ones
4. Writing – releases negative emotions and creates new scripts

Practicing Positive Thinking – Think critically without becoming negative. The left prefrontal lobe of the brain is more involved in positive emotions, and the right prefrontal lobe is more involved with negative emotions. Negative thoughts stimulate right prefrontal lobe activation. Increases in positive emotionality occur spontaneously when negativity is inhibited. Inhibiting negative thinking and behavior will automatically increase positivity.

Try to connect today's challenges with your deepest values and beliefs. If you can't come up with a basis that really connects with you emotionally, you won't meet any of your challenges. Something as simple as placing a picture of your loved ones on your office desk can help anchor the meaning behind your struggle. Victor Frankel, a WWII Nazi concentration camp survivor, believes his ability to endure the greatest horror and torture imaginable was a function of one thing – his ability to attribute meaning to his pain and suffering. The single most important search in life is to find meaning. Where there is meaning, there is also great strength.

Stress and Aging

You need a deep capacity for stress to slow the hormonal effects stress has on aging. Like a muscle, the more you stress it the more it grows. Performing challenging mental exercises – like learning a foreign language - can cause neurons in the brain to branch significantly. The key to neurological growth is always the same: stress.

Stress exposure provides many preventive-aging benefits. At Tufts University Center for Aging, researchers have identified a number of markers that are related to the aging process, and many of these same variables are influenced by exercise stress. The general conclusion is that exercise, when done properly, slows that aging process. In just about all areas of stress exposure, the aging process is significantly slowed when the hormones and the forces exerted by stress are intermittently stimulated.

General guide to protect your health from the risk of stress:

- Harbor less pessimism and more optimism
- Summon more positive fight and challenge
- Retain a feeling of control: Do Something!
- Anchor meaning and value to your struggle

- Get physical
- Rather than becoming alienated, remain actively engaged and connected to the world around you.

Recovery

Top competitors follow precise rituals of thought and actions that facilitate a brief but critical wave of mental, physical, and emotional recovery. The stress response is a form of emotional energy that will be expended, and recovery is energy restoration. Recovery is the time when growth occurs – physically, emotionally, and spiritually – after being stressed safely and effectively.

Recovery is generally associated with rest, but recovery is not necessarily a passive event. Relief from stress can be achieved through passive strategies such as meditation, prayer, sleep, and naps, or through active strategies such as running, talking, stretching, yoga, and recreational sports activities. Recovery does not mean "without movement." Both active and passive forms of healthy recovery result in highly distinct and familiar feelings of relief from stress.

Physical Recovery – The most common signals of physical recovery are:

- Physical relief
- Reduction of hunger, sleepiness, or fatigue
- Reduced muscle tension
- Increased muscle tension from exercise associated with relief from inactivity
- Declining heart rate (except for recovery exercise)
- Declining breathing rate (except for recovery exercise)

Emotional Recovery – The most powerful emotional stressors are fear, which stem from perceived threats to our physical or psychological safety, and anger. Emotional needs are expressed via various degrees of distress. The most common signals of emotional recovery are:

- Emotional relief
- Fun and enjoyment
- Increase in positive emotions
- Decrease in negative emotions
- Reduced distress
- Increased feelings of safety
- Increased feelings of self-worth
- Increased feelings of love

Mental Recovery – Relief from mental stress can take many forms. Allowing one's mind to drift away to some faraway place, to fantasize about going fishing, taking a nap, or vacationing brings momentary relief. The most common signals of mental recovery are:

- Mental relief
- A feeling of mentally slowing down
- Increased calmness

- Broadening of attention
- Increased fantasy
- Increased creativity
- Increased imagery

Areas for Recovery

1. Sleep Recovery

   7–8 hours of sleep are required for optimal functioning in the human species. Mortality rates from nearly all causes of death tend to be lowest among people who sleep between 7 and 8 hours nightly. Mortality rates are 2-1/2 times higher for those sleeping less than 4 hours and 1-1/2 to 2 times higher for those sleeping more than 10 hours. Sleep-deprived individuals suffer considerably more fatigue and average twice as many doctor visits annually. They also average twice as many infectious incidents.

   Without sleep, prolactin hormone levels escalate. Prolactin is a pituitary hormone that induces lactation and prevents ovulation. At the end of perimenopause, cortisol levels climb and estrogen and progesterone levels plummet, just as they do during labor and delivery. The immune system revs up so high it may attack cartilage and mucous membranes, creating joint pain, allergies, and autoimmune disease. When this scenario combines with insulin resistance from sleeplessness, you get fatter. If you sleep enough each night, you will lose weight as a result of your cortisol going down.

   Growth actually takes place during recovery. We grow the most during the sleep cycle. Growth hormones and repair enzymes are released most abundantly during sleep as are various chemical restoration processes.

   Factors Affecting Sleep:

   - Age – Sleep cycles become more fragile among older age groups.
   - Fitness – Fit persons require less sleep than non-fit persons. The fitter you are, the faster you recover.
   - Exercise type – Aerobic and anaerobic exercise, as well as strength training, have been shown to reduce sleep latency and increase delta sleep.
   - Timing of exercise – Vigorous exercise within 2-3 hours of sleep can significantly disturb natural sleep rhythms.
   - Diet – The effects of caffeine peak within 30 – 45 minutes after ingestion and require as long as several hours to completely clear the system. Chocolate contains both caffeine and another stimulant called theobromine. The darker the chocolate, the greater the dose of caffeine. Nicotine is also a central nervous system stimulant. Alcohol reduces the length of time it takes to fall asleep, but disruptions in both slow-wave and REM sleep is common, particularly in the second half of nighttime sleep. The size and timing of meals also impact sleep effectiveness. Large meals consumed close in time to sleep periods, particularly meals high in fats and protein, can be very disruptive.

- Other factors – Anxiety, overall stress levels, room temperature (cooler temperature promotes better sleep), noise, altitude, sunlight, and travel across time zones.

Recommendations for Optimum Sleep

- Before Bed
    - Get regular exercise daily for at least 30 minutes. Regular exercise promotes deeper sleep, but not within 4 hours before bedtime.
    - Avoid smoking, especially 2 hours before bedtime
    - Avoid alcohol, especially 4-5 hours before bedtime. Alcohol is a depressant and may help you fall asleep, but the subsequent metabolism that clears it from your body when you are sleeping causes a withdrawal syndrome. This withdrawal causes awakenings and is often associated with nightmares and sweats.
    - Avoid caffeine, especially 6 hours before bedtime. Caffeine is a stimulant that is present in coffee, cola, tea, chocolate, and various over-the-counter medications. Consider gradually reducing the amount of caffeine you consume to avoid withdrawal symptoms like headaches.
    - Avoid large meals within 2 hours of bedtime.
    - If you are hungry, a glass of milk or a light snack is a good choice. Milk contains the amino acid L-tryptophan, which has been shown in research to help people go to sleep.
    - Address issues causing anxiety
    - Utilize relaxation techniques such as massage, aromatherapy, deep breathing, meditation, or progressive muscle relaxation techniques
    - Avoid napping longer than 15-20 minutes, especially in the late afternoon or evening
    - Stop working at any task an hour before bedtime to calm mental activity.
    - Do not use the bedroom to do work. Keep your bedroom for sex and sleeping.
    - Avoid bright light before bed
- Bedtime
    - Go to bed at the same time every day
    - Ensure that your bedtime routine is calming. Read or listen to soft music
    - At bedtime, keep your mind off worries or things that upset you; avoid discussing emotional issues in bed.
    - Avoid expecting to have difficulty sleeping and worrying about it
    - Consider having pets stay outside of your sleeping area. Having a pet in bed with you may cause you to wake if you have allergies or if the pet moves around on the bed.

- Make sure your bedroom is well ventilated and a comfortable temperature (below 75F and above 54F).
- Light
  - Minimize light with window blinds, heavy curtains, or an eye mask
  - Make the bedroom as dark as possible.
  - Avoid bright night lights (red night lights have minimal impact on the brain's production of melatonin)
- Noise
  - Minimize noise with earplugs
  - Consider using a 'white-sound' machine to relax
  - Consider special sleep tapes and CDs
- Learn a relaxation technique such as progressive muscle relaxation and practice it in bed.
- Do not lie in bed for a long time trying to go to sleep. After 30 minutes of trying to sleep get up and leave the bedroom for a while and do something quiet (e.g., read or listen to quite music), but keep the lights dim
- Wake up each morning at the same time, even on weekends and days off
- Avoid irregular or continually disrupted sleep/wake schedules

2. Nutritional Recovery
   - Consuming adequate amounts of food and water is recovery strategy of the highest priority. The Nutrition chapter in this book is designed to optimize recovery.

3. Exercise
   Exercise is a mechanism of both stress and recovery. The Exercise chapter provides recommendations to enhance recovery. Here is a sampling of exercise recommendations to enhance recovery:
   - Exercise in the late afternoon if possible
   - Do some type of exercise <u>every</u> day
   - Consider interval exercise three to four times per week
   - Use vigorous exercise to get relief from highly emotional stress
   - Vary your exercise routines regularly
   - Approach your exercise as a form of play, or incorporate exercise into your play. Fun is emotional recovery
   - Any exercise is better than no exercise at all

4. Humor
   - Constantly work to improve your sense of humor. Get yourself to laugh.
   - Learn to laugh at yourself, and invite others to do so as well.
   - Look for funny things everywhere during periods of high stress.
   - Laugh as often as possible. Children laugh ten times more often than adults do.

- Resist negative humor

5. Music
   Music is a great recovery enhancer. Loud music has a tendency to speed up breathing rate and to decrease regularity (rhythm); soft music slows the breathing rate and increases regularity. Music also brings about various biochemical changes in the neocortex (the "thinking brain") and in the limbic system (the "emotional brain"). Music even affects the most primitive part of our brain, where regulation of our heart rate, respiration, and muscle tension occurs. The level of stress hormones significantly decreases during music. Music has a marked effect on learning.
   - Use music to facilitate recovery from distressful emotions.
   - Develop your own music tape for relaxation.
   - Use selected music to reduce the distress of daily commuting to work.
   - Learn to play a musical instrument or sing, to balance world-class stress.
   - Think of music as an important part of your overall training.

6. Active and Passive Rest
   Active rest refers to cycles of physical, emotional, and mental stress that involve movement of the physical body. Examples of active rest include:
   - Sex
   - Yoga
   - Tai-chi
   - Stretching
   - Walking
   - Noncompetitive tennis, biking, jogging, golf, and swimming
   - Gardening
   - Fishing

   Passive rest refers to activities that break normal cycles of physical, emotional, and mental stress and do not involve movement of the physical body (the exception is breathing). Examples include:
   - Prayer
   - Massage
   - Viewing peaceful places or scenes
   - Naps
   - Diaphragmatic breathing – Conscious breathing allows your thinking to slow down, giving yourself a real rest. Avoid chest breathing, where you expand your rib cage to breathe. Rather, try to develop a habit of diaphragmatic or "abdominal" breathing. The abdomen should move in and out with respiration instead of chest expansions. This uses the diaphragm, a core muscle at the bottom of the chest. You can breathe anywhere, just sitting on your chair at the office or sitting in your automobile.
   - Meditation – A number of myths about meditation persist – you have to sit still, you have to make your mind blank, you have to be "pure" or "good",

you have to transcend your body, you have to numb your emotions. These couldn't' be further from the truth. The essence of meditation is simply training your mind to focus. It involves attention and intention – being in the moment.

Pick something to focus on – a word, your breathing, a piece of music, a formal prayer, or even a physical activity like jogging. The trick is to keep your mind in watchful attention. Concentrate on your focus object. Disregard interruptions.

- Breath meditation is an example. Breath meditation trains your mind to better focus. The process takes 15-20 minutes and if you can do it daily it may be the most productive 15-20 minutes of "doing nothing" that you can possibly imagine.
  - You ideally need some quiet space, a room where you can meditate without interruption. You need a comfortable chair, one with arm rests if possible. Sit comfortably. Don't cross your leg. Take 3 deep relaxing breaths, and when you exhale the third time, let your eyes close
  - Use the diaphragmatic breathing technique mentioned above. Hold your breath both at the end of your inhale and your exhale. The pauses should be the same length of time that you use to breathe. For example, if you inhale over a 2-second period, then hold your breath for a 2-second pause before you begin to exhale. Keep repeating this process for every breath. Breathe only with your abdomen. Keep your chest free of movement.
  - When you feel the urge to sigh, just go with it. Sighs are relaxing, but don't force them. After the sigh return to the abdominal breathing as above. Don't be bothered by yawning; just go with it as well.
  - You will need to alter the breathing rate to accommodate how you feel. As the session progresses and your body becomes more relaxed you will usually need to decrease your breathing rate.
  - Keep your mind focused on your breathing. No matter how hard you try to keep your attention on your breathing, the mind will wander off into other thoughts. As soon as you become aware that your mind is wandering, gently retrieve it and refocus on your breathing. After several months of meditation you will begin to notice that your mind is wandering less.
  - You can use sounds (your alarm clock, a siren, music, birds singing, etc.) to remind you to pause wherever you are and whatever you are doing, breathe in and out, and enjoy the present moment. Even non-sounds, such as the rays of the

sunlight coming through the window, are as bells of mindfulness that can remind us to return to ourselves.

- Eating mindfully is an important practice of meditation. Turn off the television and refrain from reading during your meal. When the food is on the table and everyone is seated, practice breathing three times. Then, look at each person as you breathe in and out in order to be in touch with yourself and everyone at the table. Offer a smile of friendship. Experience the total process of eating. Take your time. Taste each bite. Savor the tastes, textures, aromas. Visualize the universe in each item on your plate – the light from the sun, the moisture from the clouds, the minerals from the soil, the oxygen from the air. Be with your food, as it is about to be with you.
- Reading
- Watching movies
- Listening to music
- Talking about feelings

7. Need Fulfillment
   All recovery is need fulfillment. The urge associated with a need is stress and fulfillment of the need is recovery. The healthiest people are those who know what they need and know best how to fill their needs.
   - Learn to listen to your needs. Negative emotions should be an alert of your unmet needs.
   - Become skillful in identifying your needs and responding in ways that drive real recovery
   - When unmet needs are being expressed that cannot be immediately satisfied, take the message and move on. Acknowledge the need, commit to taking care of it as soon as possible. Then get back to business.

To Summarize

Your emotional state and your energy state are nearly identical. Emotions mobilize you to respond to changing situations by turning on and off your body's various energy systems. Learning to manage your emotions, learning to manage your emotional energy, and learning to manage stress are all closely interconnected.

Energy and emotion are intimately connected. Take away energy and our empowering emotions collapse. Anything that affects us emotionally affects our energy. Rituals, acting skills, and mental preparation impact energy levels as powerfully as they do emotions.

- Stress is simply the body's response to a demand of some kind. The good news is that the stress response is highly modifiable.
- Protection from stress will not make you tougher, stronger, smarter, healthier, happier, or improve performance.
- Exposure to stress is the basis of all growth, mentally, physically, emotionally, and spiritually. One of the most powerful anti-aging agents we know of is stress.

If you want to retain functional capacity for a lifetime, seek stress for a lifetime. Moreover, the older you get, the more you must seek.

- Perception dictates chemistry. Change perception and the chemistry changes. Optimal performance is a non-distressful response. Rituals, acting skills, and mental preparation can be effectively used to change perception and emotional response.
- Once you have exceeded your capacity for stress, perception turns negative. Increase your capacity by exposing yourself to progressively greater episodes of stress, followed by full recovery. Feelings of discomfort typically accompany stress that expands capacity. If you did not experience any discomfort today, chances are that you didn't grow any. Increasing your capacity for tolerating physical stress deepens your capacity for tolerating all stress. Exercise is really stress practice. Remember that stress is emotional energy that must be expended.
- The best way to deepen capacity is to expose yourself to stress intermittently. Low levels of a brain hormone called norepinephrine are associated with helplessness and a low tolerance for stress. The real cause of depleted norepinephrine is not ordinary stress but chronic and persistent stress that permits little or no recovery for rebuilding lost reserve capacity.
- High stress cannot be equated with high risk of illness. Rather, it is chronic, protracted levels of unhealthy emotional responses such as anger, hostility, and fear that undermine immune function. The real culprit is sustained high levels of the adrenal hormone cortisol. Feelings of helplessness and of resignation that little can be done can powerfully impact immune function. It is not stress itself that compromises health, but how we respond to it.

Those who handle stressors best from a health perspective possessed highly similar coping strategies:

- They do not surrender or give up their spirit.
- They maintain a sense of control – no matter how bad things get, they can still control their own thoughts.
- They attribute some important meaning to their suffering and pain.
- They focus on good or positive things throughout each day: "I got some food today" or "I didn't get beaten today."
- They maintain a strong sense of purpose and they resolve to make it through the ordeal.

Remember,

- Awareness. Become fully aware of your feelings. Become aware of your greatest strengths, weaknesses, opportunities and threats. Acknowledge that emotions do in fact run the show. Your greatest need is getting right emotionally. When you feel right, you can change your behavior and you can perform right.
- Accountability. Acknowledge your personal accountability for who you are and who you can become. Make and accept no excuses. Challenge your rationalizations and assumptions.

- Prioritize. Choose what is most important and prioritize things in your life so that your greatest potential levels of health and youthful vitality can be realized. Realize that all time is sacred time. Your chance to change, to grow, to connect, to make a difference is both finite and infinite. Take the time. Make the time. You have a finite number of hours in a day and a finite number of days on the earth. On the other hand, every day has an infinite number of moments in which to live, to engage life, to become.
- Commitment. Make a daily personal commitment to do something concrete and tangible about them.
- Attitude. Every day is a struggle for control, not of the external world but of your internal response to it. Your attitude, thoughts and behavior have profound emotional consequences. Who you are and what you become is not so much the result of what happens in your life as the kind of attitude you choose, how you think and of how you respond to what happens. You can change the way you feel.
- Flexibility. Increase your capacity to respond to the forces of life in the most flexible, emotionally healthful ways possible. The only constant is change. Become comfortable with change and uncertainty. As Charles Darwin, put it, "It is not the strongest of the species that survives, or the most intelligent, but the one most responsive to change." Getting comfortable is emotional!
- Interconnectedness. Acknowledge the interconnectedness of all things and all phenomena. Every breath you take and every step you make; your attitude, feeling, belief, and value you hold inside; your outlook on life and sense of humor; what you say and what you do; are all intimately bound together. Connect what you do every day to your inner truths. Your personal values are your internal guide to outward behavior. Optimum health and successful aging is achievable only when you address the connectedness of all dimensions of your being – physical, intellectual, emotional and spiritual.
- Rituals. Develop rituals in your life that keep you synchronized with the rhythms of the world around you and enhance your ability to perform to your fullest potential in high-stress arenas. Healthy rituals in all areas of your life – nutrition, activity, stress-management, etc. - are protective. Rituals sustain desired behaviors by mobilizing your emotions and physiology.
- Seek Stress. Become a seeker of stress for a lifetime. Staying young, retaining functional capacity, experiencing personal growth, and maintaining maximum health all require intermittent stress exposure.
- Recovery. Structure your life to allow sufficient recovery time for balance and growth. Frequently, it's not stress that's tearing you apart; it's the lack of healing time to balance the stress.

NOTES

Optimal Longevity Lifestyle for Living Younger

"Live as you will have wished to have lived when you are dying"
– Christian Furchtegott Gellert

Most pathological diseases of aging and prematurely shortened lifespans are the result of lifestyles choices – behavioral and interactions with the environment. Fewer than 30 percent of the factors that contribute to aging-related disease and longevity are related to inherited genetics. Unhealthy choices may lead to a functional biologic age equivalent to someone 15-20 years older.

This fact is made very clear in a study that has been ongoing for more than 60 years. The Grant Study of Adult Development along with two other studies equally long-lived found that very little of the illnesses in the subjects, ranging from 50 to 85 years in age, could be attributed to genetics. The vast majority of health problems experienced by the subjects resulted from lifestyle choices. Unhealthier lifestyle choices, including smoking, negative attitudes, obesity, physical inactivity, heavy alcohol consumption, and social isolation, were more likely to predict illness or death.

Most of this book addresses the primary lifestyle choices that influence health and longevity – nutrition, exercise, nutritional supplements, hormone balancing, and stress management. Later, we will discuss the important role of emotional and spiritual well-being for optimum health and aging. However, a number of healthful (or not-so-healthful) behaviors do not clearly fall within these categories; wearing seat belts, for example.

Look at the Longevity Lifestyle Choices listed below. Some choices may already be a part of your life. If so, these factors are helping to keep you youthful or to delay premature death. Nevertheless, what else could you be doing? What changes are you willing to make?

Begin as many of these strategies as you can because they might reduce premature aging as much as 5 – 8 years, with very little effort. Once you are comfortable with them as a routine part of your life, work your way down the list, integrating additional Longevity Lifestyle behaviors, as you are able.

Longevity Lifestyle Choices

Environmental, Chemical Substance and Toxin Exposure

- **Save your Skin**.
  Time doesn't do that much to our skin. But the sun does; approximately 90% of the changes that occur with age result from the sun. Melanoma, the most dangerous form of skin cancer, is strongly associated with excessive sun exposure, especially when the skin has been sunburned. Theoretically, a single sunburn can be enough to lead to melanoma many years or decades later. The

American Cancer Society estimates that 90% of all skin cancers are caused by exposure to the sun. On the other hand, some ultraviolet B exposure from the sun has been associated with a reduced risk for several other forms of cancer – breast, prostate, colon, ovary, and lymphoma. Judicious, regular, short-term exposure to non-burning sunlight may be cancer protective. The sun stimulates vitamin D synthesis in the skin, provides phototherapy for various skin conditions (e.g., Psoriasis), and has psychological benefits for many. It is necessary to get enough sun, but not too much.

- Ultraviolet A (UVA) – is present from sunup to sundown and goes through glass. It is responsible for premature photoaging and augments UVB damage to promote skin cancer
- Ultraviolet B (UVB) – peaks at noon and is reflected by glass. It is responsible for sunburn. It induces skin cancer
- 75% of the UV radiation still reaches the earth's surface on cloudy days
- Avoid sun exposure
  - 8:30 am to 4:30 pm in the Summer
  - 9:30 am to 3:30 pm in the Spring and Fall
  - 11:00 am to 2:00 pm in the Winter
- Avoid reflected surfaces if possible: white concrete, sand, water and snow can reflect up to an additional 85% of the sun's UV radiation
- Sunscreen
  - Sunscreen blocks all UVB and most UVA
    - Parsol 1789 (avobenzone) is effective but can be highly irritating to some users. Benzophenone (also known as oxybenzone) is another option. Your best bet is to choose chemical-free, natural sunscreens – titanium dioxide, zinc oxide and PABA.
    - choose an SPF of at least 30 (45 would be better) for both UVA and UVB radiation
    - Apply liberally to dry skin. Most people don't slather on even close enough. Apply an ounce
    - allow 20 minutes before getting wet or sweating
    - apply first thing in the morning
    - Sunscreens and sunblocks only get used up while you are in the sun, unless it is rubbed or washed off
  - Sunblock blocks all UVB and almost all UVA – micronized Zinc oxide and/or titanium dioxide
  - Lip protection
- Wear sunglasses that protect at least 99 percent of UVA and UVB rays. Cataracts result, in part, from the free radical damage inflicted by the sun
- Avoid tanning beds. The Journal of the National Cancer Institute reported a study where women who used tanning parlors once a month or more increased their risk of developing malignant melanoma by more than 55 percent. The risk was highest for young adults.

- Self-tanning skin products are a safer alternative to lying out in the sun or in tanning bed. Try L'Oreal Sublime Bronze self-tanning lotion or gel, which also provides a sunscreen with an SPF of 15
- Get clothed. Wear a protective hat (with at least a 4 inch brim) and loose clothing to cover exposed skin when outdoors more than 20 minutes Bleached cotton and loosely woven knits only provide an SPF of 7. Clothes made of unbleached cotton, blue or black denim, satin-finish silk and 100-percent polyester provide some protection from the sun. The best clothing on the market for sun protection is the specially blended fabric that has an SPF of 30 or more.
- Tea drinkers have a lower rate of developing skin cancers, apparently because of tea's antioxidant/anti-inflammatory effect. One study showed that black tea drinkers had a 40 percent lower risk of developing squamous cell skin cancer.

Protecting your Skin

No cosmetic product can erase the damage caused by the two biggest enemies of healthy skin: sun exposure and smoking. Skin ages in two ways: intrinsically, which is controlled by our genes, and extrinsically, which covers all our bad and good habits and the effects of the environment. With sun damage, there's irregular pigmentation and big dark patches as well as freckling. Previously, I discussed sun protection to protect your skin. With intrinsic aging, wrinkling is just fine lines. With sun damage, it can be thick, coarse wrinkling like the farmers who have those crosshatched lines on the back of their neck. Smoking makes skin look gray and exaggerates wrinkles. A smoker at 40 looks many years older than a nonsmoker at the same age.

Here are ingredients to look for if you're trying to attack some specific skin problems:

- General dryness and loss of elasticity
  Moisturize, moisturize, moisturize. In a younger woman who is just starting to see wrinkles, the most effective products are very aggressive hydrating creams or lotions. Products containing ceramides, triglycerides or cholesterol are also helpful. They may be negatives in your blood stream, but on your skin, they're helpful. Products with retinol could stimulate cell growth, which should help as well.
- Age spots
  Also called sun spots or liver spots, these are flat areas of brown skin on the face, neck and chest, top of the hands or forearms. If you have a lot of them, you should check with a dermatologist because they indicate that you've had considerable sun damage and may therefore be more at risk for skin cancer. Nonprescription products that may help contain the bleaching agent hydroquinone. Combining a bleaching agent with an exfoliant, retinol creams or glycolic acid creams and lotions can accelerate the fading you get from bleaching. However, you need to use a good sunscreen as well; otherwise, any bleaching will be wiped away by a few

strong rays. If there's no improvement in a few months, see a physician. A dermatologist can prescribe more powerful bleaching agents or administer peels and other treatments.

- Fine lines and puffiness around the eyes
  Wrinkles anywhere look better if the skin is moisturized. Retinols and alpha hydroxy acids like glycolic acid smooth skin, as well. Retinol is available in low-concentration derivatives of retinoids, but it is not as effective as the prescription strength. Nevertheless, it offers an alternative to patients who are sensitive to prescription-strength Retin-A®. Retinoic acid improves fine wrinkles, lightens brown spots and smoothes skin.

  If the problem is allergies or lack of sleep, then you need to take antihistamines or get more rest. Traditional cures, like cucumber slices, tea bags or an astringent gel, can also help if the puffiness is just temporary. However, in many cases, the cause is protruding fat pads above or beneath the eyes. Then, you need to see a doctor for surgery to remove the fat pads. Nothing sold in a drug or department store – including hemorrhoid cream – an often-cited cure, is likely to be of much help.

  Alpha hydroxy acids (AHAs) that contain glycolic, lactic and pyruvic acids are available in many cleansers and moisturizers. These compounds decrease corneocyte cohesion and stimulate collagen and elastin production. This improves tone, texture, pigmentation and fine wrinkles. AHAs are available in concentrations up to 10 percent over the counter. Dermatologists and other cosmetic specialists use concentrations up to 70 percent in peeling solutions.

- Laugh lines and lines around the lips:
  Injectable fillers and Botox injections will help those upper lip lines that make lipstick bleed.

Even if none of these issues is facing you in the mirror now, you should pay more attention to your skin-care regimen as you age. A basic routine should always include sunblock, winter, spring, summer and fall. As for SPF, 30 is better than 15. Choose sunblocks with micronized zinc or titanium because they block all forms of light. Try a mild cleanser like Cetaphil or Caress and some sort of abrasive like a mild buff puff to increase skin turnover time. A toner before applying makeup is also good, especially if your skin tends to be oily. If you have combination skin, you can use the toner just in the oilier T-zone (forehead and nose). Apply moisturizer to any area that seems dry. Though it may not seem to have much connection to your face, regular exercise increases the blood supply to the skin, another thing that worsens as we age.

- **Tobacco**
  In addition to lung cancer, there are a myriad of other diseases caused by tobacco use.
  Smoking causes most COPD (chronic obstructive pulmonary disease) cases, approximately 85%, including emphysema.[9] In 2002, over 75% of oral cancer was caused by tobacco use.[10] Next to sun exposure, smoking is the second leading cause of skin aging. Smoking is also shown to cause developmental defects and other health problems in children.
    - Don't smoke
    - Avoid exposure to second hand smoke
    - Don't chew tobacco

- **Environmental Toxins**
    - Dioxin. Dioxin is one of the most potent carcinogens known. Created through the manufacture of plastics, pesticides, and other chemicals, dioxin is spewed from smokestacks, and rained onto soil where it is absorbed by plants we and animals consume. When you wrap your food in plastic, then microwave it, you create carcinogens from the dioxin in the plastics.
    - Mercury is one of the worst toxins in the environment. You can help move mercury out of your system by eating chlorella prior to eating fish. Chlorella is a type of algae, sold as a food supplement. Neutralize mercury within the body using selenium supplementation, 200-400 mcg per day
    - Avoid commercial household cleaners. Instead, use vinegar and water
    - Outgassing from building materials and carpets can reach high levels, particularly in tightly insulated homes. Use stand-alone air filters and houseplants. Open the windows. Use natural floorings or ceramic tile rather than carpets. If you opt for carpet, choose natural fiber wool rugs and carpets. Buy safe, natural, nontoxic paints and household cleaners
    - Office machines can release toxic fumes. Move printers, copiers, and fax machines as far as possible from your workspace; ventilate the area where these machines are used
    - Use radon mitigation systems if your home tests high in radon
    - Avoid air pollution and environmental toxins. Use high quality air purification systems for your home
    - Noise – people could avoid most hearing loss if they weren't exposed to loud noises. Very little hearing loss is noted in primitive tribes, but 60%t of college freshmen in the U.S. already have evidence of diminished hearing

- **Food**
    - Alcohol - Drink alcohol in moderation, unless you have a family or personal history of alcohol or other substance abuse, or a liver disorder
    - Eat organic (see Nutrition chapter)
        - Avoid animal products containing hormones and antibiotics

        - Avoid genetically engineered produce, grown with synthetic fertilizers and sprayed with chemical pesticides
    - Drink purified water. Drinking water may contain over seven hundred chemicals
    - Wash produce adequately before consumption
    - Microwave your food in glass; don't use plastic wrap
    - Drink form glass bottles
- Address drug abuse and addiction

Transportation

- Always wear a helmet when riding a bike or motorcycle
- Take proper precautions when driving a car.
    - Whether you're talking on a cell phone, chomping on a burger, or changing CDs, doing more than driving could lead to disaster. According to the National Highway Traffic Safety Administration and the Virginia Tech Transportation Institute, the top 10 driver distractions include, in descending order:
        - Using a wireless device such as a cell phone (even hands-free)
        - Chatting and interacting with passengers
        - Reaching for CDs, or other internal distractions
        - Programming radio stations and tinkering with your dashboard
        - Using an electric razor or checking lipstick, and other actions related to personal hygiene
        - Unwrapping a burger or other things when eating at the wheel
        - External distractions such as pointing out a funny billboard
        - Talking or singing to yourself
        - Daydreaming
    - Wear seat belts – always!
    - Never use a cell phone while driving
    - Drive a car with front and side airbags
    - Don't exceed the speed limit
    - Don't drive after drinking alcohol

Health Maintenance

- **Dental Hygiene**
    - A university study found that only 16% of the men in the study flossed their teeth at least 4 times per week. Most people are missing a great opportunity to live longer with such a simple activity.
    - Begin with a dental rinse (e.g., Plax) to loosen plaque prior to brushing
    - Use a non-abrasive fluoride toothpaste
    - Brush with an electric toothbrush (e.g., Braun 3-D or Sonicare) two to three times daily. These electric brushes can remove 10% more plaque than a manual brush
    - Rinse with a mouthwash designed to kill organisms which cause plaque (e.g., Listerine)

- Floss daily
- Use a fluoride rinse once daily (e.g., ACT)
- Consider using a tongue scraper daily

- **Infectious Disease Prevention**
  - Vaccines are among the great success stories in public health and are among the most cost-effective health interventions. The burden of vaccine-preventable diseases in adults in the U.S. is staggering. Approximately 43,000 U.S. adults die annually of vaccine-preventable diseases. Pneumonia and influenza were the fifth leading cause of death in all persons aged 65 and older based on 2000 national mortality data. Vaccine-preventable diseases include:
    - Children and adolescents
      - Measles
      - Mumps
      - Rubella German measles)
      - Chickenpox
      - Diphtheria
      - Tetanus
      - Pertussis
      - Haemophilus influenzae, type B (meningitis)
      - Polio
    - Adults
      - Tdap – a combination of tetanus and Pertussis
      - Hepatitis A
      - Hepatitis B
      - Pneumococcal pneumonia – all adults aged 65 and older
      - Influenza – all adults and especially anyone 50 years of age and older or with chronic health conditions
      - Herpes Zoster, shingles
        - Lifetime incidence is 10-20%; 50% after age 85
        - Increased in immunocompromised individuals and patients with hematological malignancies
        - One-time vaccine recommended prophylactically for adults aged 60 and older
        - Not indicated for treatment of shingles or post-herpetic neuralgia
        - Those who had shingles a decade or more ago can receive the vaccine to prevent recurrence, but is not indicated in those who have recently recovered
  - Wash your hands frequently throughout the day, especially during cold and flu season. Ten to twenty times per day may not be obsessive compulsive if in fact you are exposed to many people.
    - Wash your hands frequently
    - Wash before handling and eating food
    - Wash after using the restroom

- Stay alert to disease threats when you travel. Get all the recommended vaccinations
- Don't ever drink untreated water while hiking or camping
- Tell your doctor if an infection does not improve after you have taken a full course of antibiotics

- **Screening**
  - **Dental examinations** every 6 months
    The gateway for most organisms to the body is through the mouth. Most of the degenerative diseases of aging are the result of inflammation. Gingivitis and periodontal disease are closely linked with systemic silent inflammation. Nearly 30,000 Americans are diagnosed each year with mouth or throat cancer. Sadly, fewer than 50% survive five years because the disease is usually not diagnosed until it has reached an advanced stage

  - **Eye examinations**, including eye dilation, at least every 2 years (annually for diabetics), for glaucoma and age-related macular degeneration. Additionally, eye examination allows direct visualization of the vascular system for evidence of atherosclerosis and diabetes.

    Glaucoma is the second leading cause of blindness in the U.S. It affects an estimated 3 million Americans, with 120,000 blind due to the condition.
    Risk factors for glaucoma:
    - Over age 60
    - Family member with glaucoma
    - African-American
    - Asians
    - Steroid users
    - Eye injury
    - Hypertension
    - Diabetes
    - Near sightedness
    - Central corneal thickness less than 0.5 mm

    Age-related macular degeneration (AMD) is a progressive eye condition affecting as many as 15 million Americans. AMD is the number one cause of vision loss and legal blindness in adults over 60 in the U.S. As our population ages, and the "baby boomers" advance into their 50's and 60's, we will see a virtual epidemic of AMD. Perhaps 14%-24% of the U.S. population aged 65-74 years and 35% of people aged 75 years or more have the disease.
    Risk factors for age-related macular degeneration:
    - Smoking
    - Obesity. Research studies suggest a link between obesity and the progression of early and intermediate stage AMD to advanced AMD

- Race. Whites are much more likely to lose vision from AMD than African Americans
- Family history. People with a family history of AMD are at higher risk of getting the disease
- Gender. Women appear to be at greater risk than men

- **Skin examination** annually for cancer (see above for prevention measures)
  54,000 Americans are diagnosed with melanoma annually.
  9,000 skin cancer deaths annually in the U.S.
  25 percent of Americans who get skin cancer are under age 40, and melanoma is now the most common and deadliest form of cancer in women ages 25-29, according the Skin Cancer Foundation.
  Risk factors for all skin cancers
  - History of sunburns
  - Fair complexion
  - Unusual freckles or moles
  - A previous diagnosis or family history of skin cancer
  - Working outdoors
  - Participating in outdoor sports or activities
  - Living in sunny climates

  Malignant melanomas, the most deadly of skin cancers, are increasing in incidence at epidemic proportions. 20% of all patients diagnosed with malignant melanoma will die from a disease that, if treated early, is virtually 100% curable. While melanoma is the most potentially fatal form of skin cancer, it is only one of 15 skin cancers.

  Skin Self-Examination
  Coupled with a yearly skin exam by a doctor, self-examination of your skin once a month is the best way to detect the early warning signs of basal cell carcinoma, squamous cell carcinoma, and malignant melanoma, the three main types of skin cancer. Look for a new growth or any skin change.

  What you will need: a bright light; a full-length mirror; a hand mirror; two chairs or stools; a blow-dryer
  - Examine head and face, using one or both mirrors.
  - Use blow-dryer to inspect scalp
  - Check hands, including nails
  - In full-length mirror, examine elbows, arms, underarms. Focus on neck, chest, and torso. Women: Check under breasts
  - With back to the mirror, use hand mirror to inspect back of neck, shoulders, upper arms, back, buttocks, legs
  - Sitting down, check legs and feet, including soles, heels, and nails. Use hand mirror to examine genitals.

What to look for (the ABCDEs of skin examination):

- **A**symmetry: One half doesn't match the other half. 'Healthy' moles tend to be symmetrical and fairly round
- **B**order irregularity: The edges are scalloped, ragged, notched, or blurred.
- **C**olor: The pigmentation is not uniform. Shades of tan, brown, and black are present. Dashes of red, white, and blue add to the mottled appearance. Changes in color distribution, especially the spread of color from the edge of a mole into the surrounding skin, also are an early sign of melanoma.
- **D**iameter: The mole or skin growth is larger than 0.2 inches, or about the size of a pencil eraser. Any growth of a mole should be of concern.
- **E**volving: means any change in
    - Size -- growing larger or smaller
    - Shape
    - Shade of color
    - Bleeding
    - Feel - itching, tenderness

Many skin cancers occur in places not easily seen on self-examination. If you have a partner, periodically get naked and examine one other – for skin lesions.

- **<u>Mammograms and Digital Infrared Thermal Imaging</u>** for breast cancer
More than 211,000 women will be diagnosed with breast cancer and 43,300 die during 2005 in the U.S. One woman in eight either has or will develop breast cancer in her lifetime. In addition, 1,600 men will be diagnosed with breast cancer and 400 will die this year. Seventy-five percent of the breast cancer diagnoses are made after the age of 50. The largest group of women to get cancer at any one time is ages 45-50. If detected early, the five-year survival rate exceeds 95%. Women should have a clinical breast exam every three years, starting in their 20s. Mammograms are among the best early detection methods
    - Age 40 – every 1-2 years, or sooner if significant risk factors:
        - a family history of breast cancer
        - breast abnormalities, such as atypical hyperplasia or LCIS (lobular carcinoma in situ)
        - breast density of 75 percent or more (for women over 45)
        - having had chest irradiation at age 30 or younger (for conditions such as Hodgkin's disease)
        - having a first child after age 30
    - Age 50 – annually
    - Age 70 – based on woman's heath and whether or not she has other serious illnesses

Digital Infrared Thermal Imaging (DITI) is a non-invasive alternative that can indicate early stage breast disease. DITI uses no radiation and no contact with the body. It is especially appropriate for younger women (30-50) whose denser breast tissue makes it more difficult for mammography to be effective. DITI is also for women of all ages who, for many reasons, are unable to undergo routine mammography.

The American Cancer Society calls for an MRI in addition to annual mammography for high-risk women. These include women who have at least a 20% lifetime risk of breast cancer on standard risk models, plus women with specific medical histories. A recent study also suggests that women who have cancer diagnosed in one breast would benefit from an immediate MRI of the other.

- **Pap Smears** for cervical cancer
  In 2004, there were approximately 10, 520 new cases of cervical cancer in the United States, with 3,900 deaths, making it the third most common cancer of the female genital tract.

  Nearly all cancers of the cervix (> 75%) including non-squamous tumors (adenocarcinomas) are related to chronic infections with the human papillomavirus (HPV). A vaccine has been approved, that will reduce the incidence of this disease, although it will take many years to vaccinate the population and actually see a reduction in cervical cancer rates. The vaccine must be administered prior to first sexual contact.
  Pap smear criteria:
  - Unnecessary if you have had a hysterectomy, with removal of the cervix along with the uterus
  - Age 21 (earlier if sexually active) through age 30 – every 1-2 years
  - After age 30 – every 2-3 years after three consecutive normal tests, or both the Pap smear and HPV (human papilloma virus) every three years after one normal result on both tests. Women at high risk for cervical cancer (multiple sex partners, certain viruses, venereal warts, and smoking) may need them more frequently
  - Age 70 – discontinue with 3 prior consecutively normal pap smears and no abnormal pap smear results for the past 10 years

- **Colonoscopy** for colon cancer
  Colorectal Cancer is the second leading cancer killer trailing only lung cancer in annual US cancer deaths. The American Cancer Society estimates that in the United States 146,940 cases of colorectal cancer were diagnosed in 2004 and 56,730 occurred. Colon cancer is generally a rather slow growing disease, taking about 10 years to develop. Most develop from adenomatous polyps in the colon. Fortunately, colorectal cancer is easily detectable with screening techniques that can catch the cancer when it is still treatable. In addition, when found during

colonoscopy the physician can remove the polyp through the scope, essentially preventing the polyp from going on to become a cancer in the future.

- Age 50 – once every 10 years
- Individuals who have a family history of colorectal cancer, previous polyps, or certain gastrointestinal diseases may need to be screened at an earlier age or more frequently based on the advice of their physician

- **Bone Density examination** for osteoporosis

Osteoporosis is a major public health threat for an estimated 44 million Americans or 55 percent of the people 50 years of age and older. In the U.S., 10 million individuals are estimated to already have the disease and almost 34 million more are estimated to have low bone mass, placing them at increased risk for osteoporosis. Of the 10 million Americans estimated to have osteoporosis, eight million are women and two million are men.

One in two women and one in four men over age 50 will have an osteoporosis-related fracture in their remaining lifetime. Osteoporosis is responsible for more than 1.5 million fractures annually. Each year, half a million Americans wind up in the hospital because of osteoporosis-related fractures. Hip fractures represent nearly 300,000 of that total. One in five dies within a year, and half are never able to live independently again. Complications of osteoporosis kill more women every year than breast cancer.

General Risk Factors for Osteoporosis

- Advanced age
- History of falls
- Personal history of fracture as an adult
- Low body weight
- Sedentary life style
- Calcium or vitamin D deficiency
- Cigarette smoking
- Elevated homocysteine levels
- Impaired vision
- High caffeine intake
- Immobilization
- Eating disorders
- Recent falls/fall risk
- Poor health
- Height loss of 1.5 inches
- Alcohol abuse
- Family history of osteoporosis or fractures in first-degree relative
- History of medical conditions associated with low bone mineral density

- Glucocorticoids
- Heparin
- Warfarin
- Thyroid hormone excess
- GnRH analogues
- Lithium
- Methotrexate
- Antiepileptics

- Additional Gender-related Risk Factors
  - Women
    - Premenopausal
      - Any history of a medical condition potentially associated with bone loss
      - Any history of surgery that might result in bone loss: GI resection, oophorectomy, transplantation
      - Any chronic therapy with drugs known to accelerate bone loss
      - Unexplained fragility fractures
    - Postmenopausal
      - All postmenopausal women age greater than 65
      - All postmenopausal women age less than 65 with one or more risk factors, with a history of fragility fractures, on estrogen for prolonged periods and women coming off estrogen
    - Weight under 127 pounds
    - Caucasian/Asian
    - Female
    - Small frame
    - Ovarectomy at an early age
    - Individuals with vertebral abnormalities
    - Receiving glucocorticoid therapy
    - Primary hyperparathyroidism
    - High bone turnover
    - To assess response to therapy
  - Men
    - Age greater than 69 years
    - Age 55-69 with risk factors (previous fracture, smoker, family history, body mass index less than 18)
    - Receiving glucocorticoid therapy
    - Hypogonadism
    - Any medical surgical therapeutic history that might be associated with accelerated bone loss (i.e., Lupron for prostate CA)
    - History of prior fragility fractures

- Medical condition known to increase the risk of bone loss (hypogonadism or hyperparathyroidism)

- **<u>Prostate Screening</u>** for cancer
  Approximately 230,000 American men are diagnosed annually with prostate cancer, and nearly 30,000 will die from it.
  - PSA blood test
    - Begin at age 40:
      - If PSA < 0.6 delay further screening until age 50, except African-American males, whose annual screening should start at age 45
      - If PSA > 0.5 monitor annually with PSA and digital rectal exam
    - If PSA >2.5 refer for biopsy (up to 25% of men with PSA between 2.5 and 4.0 have prostate cancer)
    - Beginning at age 50 - annually
  - Digital rectal prostate examination – annually at age 50, or sooner if symptomatic

- **<u>Fasting Plasma Glucose (FPG) or Oral Glucose Tolerance Test (OGTT)</u>**
  There are 18.2 million people in the United States, or 6.3% of the population, who have diabetes. Twenty percent of adults age 60 and older have diabetes. While an estimated 13 million have been diagnosed with diabetes, unfortunately, 5.2 million people (or nearly one-third) are unaware that they have the disease. There are 41 million Americans who have pre-diabetes, in addition to the 18.2 million with diabetes
  - After the age 45 (plus any one of the following criteria) – every 3 years if
    - Habitual physical inactivity
    - A family history of Type 1 or Type 2 diabetes
    - A personal history of gestational diabetes
    - Obesity
    - Inactivity
    - Delivering a baby weighing > 9 lb (diabetics often give birth to heavier babies)
    - High blood pressure
    - Being of African, Hispanic, Native American, or Pacific Island descent
    - HDL cholesterol less than 35 mg/dl and/or triglycerides > 250 mg/dl
    - Polycystic ovary disease
    - History of vascular disease
  - Annually if
    - Previous impaired fasting glucose or impaired glucose tolerance test

- Overweight with one or more risk factors

- **Lipid Profile**
  The Framingham Heart Study established that high blood cholesterol is a risk factor for coronary heart disease (CHD). Results of the Framingham study showed that the higher the cholesterol level, the greater the CHD risk. On the other end of the spectrum, CHD is uncommon at total cholesterol levels below 150 milligrams per deciliter (mg/dL). A direct link between high blood cholesterol and CHD has been confirmed by the Lipid Research Clinics-Coronary Primary Prevention Trial (1984) which showed that lowering total and LDL ("bad") cholesterol levels significantly reduces CHD. A series of more recent trials of cholesterol lowering using statin drugs have demonstrated conclusively that lowering total cholesterol and LDL-cholesterol reduces the chance of having a heart attack, needing bypass surgery or angioplasty, and dying of CHD-related causes
  - Age 20 – at least every 5 years
  - Children and teens that have a family history of early heart disease or total cholesterol above 240 mg/dL should be screened sooner.

- **Thyroid Profile** for hypothyroidism or low functioning thyroid - beginning at age 35, and at least every 5 years
  The prevalence of mild thyroid failure is approximately 10% in the general population and 20% in older women.

- **Blood Pressure screen** – Annual screening of adults age 18 and older for hypertension, if no previous high blood pressure
  High blood pressure is a major health problem in the United States, where more than 50 million people over age six (and 1 in 4 adults) have the condition, according to the U.S. Centers for Disease Control and Prevention. Another 22 percent, or 45 million, Americans have pre-hypertension, which is defined as blood pressure that is on the borderline between normal and elevated. Of the people with high blood pressure, 30 percent don't know they have it, and another 36 percent either aren't on medication or don't have their blood pressure adequately controlled by the medications they do take

- **Ovarian Cancer screen**
  According to the American Cancer Society, ovarian cancer accounts for 3 percent of all cancers among women and ranks fourth as a cause of their deaths from cancer. The American Cancer Society statistics for ovarian cancer estimate that there will be 22,220 new cases and 16,210 deaths in 2005. Five-year survival rates among women with advanced ovarian cancer range from 20% to 30%, but women diagnosed when their cancer is still confined to the ovary have a 70% to 90% survival rate.
  - Risk Factors
    - Genetic predisposition
    - Personal or family history of breast, ovarian or colon cancers

        - Undesired infertility
    - Symptoms. When any of these symptoms has been present for less than a year and occurs more than 12 days a month, they are considered independently predictive of ovarian cancer risk.
        - Pelvic or abdominal pain or discomfort
        - Vague, but persistent gastrointestinal upsets such as gas, nausea, and indigestion
        - Feeling full quickly
        - Frequency and/or urgency of urination in absence of an infection
        - Unexplained weight gain or weight loss
        - Pelvic and/or abdominal swelling bloating and/or feeling of fullness
        - Ongoing unusual fatigue
        - Unexplained changes in bowel habits
    - Screening. When above symptoms are present and persist
        - CA-125 blood test
        - Trans-vaginal ultrasound of the uterus

- **Address your Health Problems and Risk Factors**
    - Excessive body fat
    - Hypertension
    - Hyperlipidemia
    - Hormone imbalances
    - Elevated homocysteine
    - Elevated hs-CRP
    - Elevated lipoprotein (a)
    - Chronic diseases
    - Use your medications exactly as prescribed. Don't self-medicate with antibiotics or lend your medicine to anyone.

Nurture Your Mind and Intellect

Growing evidence indicates that rather than your mind fading with old age, you can take steps to help keep your brain sharp. Research by the National Institute on Aging showed that targeted mental training could reverse as much as 7-14 years of cognitive decline! Other studies indicate that the human brain can regenerate. There are also anatomical differences between adults who regularly engage certain brain centers and those who do not.

- **Stimulate your Mind**
    - Turn off the television
    - Learn new things regularly
    - Play intellectual games
    - Remain curious
    - Try new things
    - Carry a notebook at all times to record your ideas
    - Try to write with your non-dominant hand

    - Maintain a journal
- **Become a Lifelong Learner.** It is never too late to learn something new
    - Read a good book
    - Try tongue twisters or brain teasers
    - Practice your math skills
    - Ask questions
    - Challenge your long-standing opinions and assumptions
    - Use your eyes and ears. Look and listen; see and hear
    - Enroll in a class at a local community college
    - Take up a musical instrument or learn to dance
    - Learn a new language
- **Brain Workouts**. Try these brain workouts, proven to make a difference in the long run:
    - Try experimenting with mnemonics, a technique that uses associations to link information. The University of Texas at Austin offers an overview of mnemonics at http://www.utexas.edu/student/utlc/makinggrade/mnemonic.html.
    - Courses in mind- or memory-training may help
    - Memory and learning
        - Memorize favorite poems or songs
        - Learn to identify birds
        - Memorize new dance steps
        - Visualization helps memory. Painting mental pictures can help make your memory more reliable.
    - Concentration
        - Play computer games
        - Play chess or bridge
    - Planning
        - Design your own Web site
        - Plan a garden
        - Organize a fund raiser
    - Language
        - Join a book discussion group
        - Do crossword puzzles or word games
        - Learn a new language
        - Take a sentence from a magazine or newspaper, and make another sentence using the same words
    - Spatial relationships
        - Learn to draw
        - Take a pottery class
        - Play board games
        - Walk into a room where there's a group of people. Note how many individuals are on your right and on your left. Also discern the left-right distribution of furniture
        - In an unfamiliar room, observe large and small objects of different sorts. Think of the outline of each item; note their visual texture,

length and thickness. When you're alone, draw a map of the room and the detail of one or two objects in it.
    - Logic
        - Avoid making a grocery shopping list. Instead, invent a system to help you remember all the items you need. Employ memory aids, such as classifying foods into raw and cooked. Or, devise a logical system of your own
        - Games involve logical activities. Card games or board games of strategy such as chess or checkers are good choices
        - Crossword puzzles and anagrams
    - Reaction speed and manual dexterity
        - Play ping-pong or tennis
        - Play a musical instrument
        - Assemble jigsaw puzzles
- **Get Creative**. Creative minds have greater tolerance for the uncertainties of life that so often is a source of unnecessary stress for the rest of us. Have you always wanted to paint, sculpt, act, invent, compose music, design, grow flowers, arrange flowers, write, etc? What is stopping you?
    - Remain creative by reviewing the needs you wish to gratify in your life and the skills to accomplish it
    - Maintain a belief in your capacity to give something of value that may endure, nurture, teach, or comfort
    - Model your efforts on those people whom you admire
    - Allow yourself to be surprised

Manage your Time and your Priorities

- **Set priorities**. Realize that you can only do so much in a day. Your priorities should address the needs of your whole being – physical, intellectual, emotional, and spiritual
- **Organize your day**. Avoid the pitfall of always letting the immediate demands control your life. Create a definite plan for the day based on your priorities
- **Delegate**. You can't do everything yourself. Learn to train and depend on others
- **Tackle tough jobs first**
- **Minimize meeting time**
- **Avoid letting tasks build up**. Don't put off until tomorrow the things you can do today. Plan ahead
- **Don't be a perfectionist**. You can never really achieve perfection anyway. Do your best in a reasonable amount of time and then move on to other important tasks

Improve your Emotional Longevity

- Build and maintain a social network
    - Stay in touch with your family and friends
- Become involved in your community
    - Volunteer
    - Join clubs or organizations

    - Participate in community activities
- Sex – enjoy sex as a loving and sacred communion. Research links sex (with all safer sex precautions taken) to numerous physiological benefits, from longevity to pain relief. Many studies don't address whether the health bonus comes from the act itself or from the corresponding emotional intimacy, but the bottom line is that getting physical has some great side effects – especially for women. For example, sexual intercourse once or twice a week raises the body's level of the immune-boosting antibody immunoglobin-A by a third. Exercise burns calories – a little over four calories a minute. The increase in endorphins and corticosteroids during arousal and orgasm has been found to have analgesic effects. As they age, women need to keep the pelvic floor muscles strong to avoid peeing accidentally. The same muscles are exercised during intercourse, and as with all muscle-building programs, the benefits require consistency. Finally, sexual activity that provides (mutual) satisfaction in both quantity and quality is linked to greater longevity.
    - Have safe sex
    - Have sex regularly
    - Have sex often
    - Have fun
- Get a good night's sleep. Getting a good night's sleep is one of the most important determinants of how long people live. Furthermore, thousands of highway deaths result from driving under the influence of sleep deprivation. The Stress-Response Management chapter offers tips for optimizing sleep.
- Own a pet. Take it for walks and play with it frequently
- Do the best that you can, and don't judge others
- Connect with your source as often as possible

Get an Attitude

- Develop a positive attitude. A positive attitude about the future has been linked with greater longevity
- Get outside and enjoy nature every day. Commune with nature
- Do what you love; health and healing will follow.
- Get Happy. Make fun and relaxation a daily priority
    - Learn to love yourself, really. Once your forgive yourself, it's easy to forgive others.
    - Surround yourself with people who make you feel good.
    - Call your friends or family today
    - Call or write to an old friend
    - Tell someone you haven't told in a while that you love them
    - Heal your relationship with your parents.
    - Assess your marriage. How is your marriage doing? Ask yourself the following questions from the book "Fighting for Your Marriage" by Scott Stanley, Ph.D., Howard Markman, Ph.D., and Susan L. Blumberg, Ph.D. If you answer yes to 1or 2 of these, that's fine. Everyone goes through rough patches. However, if you consistently answer yes to a lot of these

questions, it's a very good idea to start figuring out how you can improve your marriage. Life is too short to be miserable.

- Do routine discussions often erupt into destructive arguments?
- Do you or your partner often withdraw or refuse to talk about important issues?
- Do you or your partner often disregard what the other says, or do you often use put-downs?
- Does it seem that the things you say to your partner are often heard much more negatively than you intended?
- Do you feel that there has to be a winner and a loser when you disagree?
- Does your relationship often take a backseat to other interests?
- Do you often think about what it would be like to be with someone else?
- Does the thought of still being with your partner a few years from now disturb you?

- Fill your home with things that support and nurture you
- Take a vacation. Americans lag way behind other developed countries in taking time off.
- Reconnect with a mentor. Alternatively, read a book about mentors, such as "Tuesdays with Morrie" by Mitch Albom.
- Laugh often. Children laugh approximately ten times more frequently than adults do. Laughter is a wonderful way to generate the release of a cascade of healing neuropeptides and hormones throughout our body.

Nurture your Senses

Interaction is life. The more acutely you maintain your interactive capacities, the more your days will gratify you. It is our five senses that enable us to interact with other and with the universe. Unfortunately, decreasing your sensory perception by not exercising your senses is easier than heightening your senses by exposing yourself to more sensory input. You must honor your senses and tend to them as you age. Be aware of them, protect them and repair them.

Some hobbies are all about nurturing our senses; things like wine tasting, cooking, avid music listening, even massage. Developing each of your five senses enlivens your experiences in life. Additionally, it is not possible to be fully engaged in the world through your senses and at the same time worry about the past or the future. Tuning in to your senses is a way to live in the here and now. Your brain can concentrate hard on only one sense at a time. Visual stimulation often dominates other forms of sense stimulation. So as you practice and develop your senses, be aware of sensory distractions.

- **Sight**
  - Become more sensitive to color harmonies and clashes
  - Observe the color of all your friend's eyes
  - Look out into the far horizon and up to the sky at least once a day
  - Describe a scene in detail

    - Use your sight to exercise your memory. To exercise your short-term memory, for six days in a row study and immediately sketch an object or a person. On the seventh day exercise your long-term memory; redraw the six objects or people you studied earlier.
- **Hearing** - Work on listening skills
    - Listen to music regularly
    - Enjoy silence
    - Observe subtle changes in a person's voice tone, volume, and inflection
    - Attempt to recognize callers before they identify themselves; then memorize each caller's phone number. Each day before you go to bed, write down the names and phone numbers of the people with whom you've spoken. At the end of the week, write down as many names and phone numbers of your callers as you can remember.
- **Smell/Taste**
    - What is your favorite scent?
    - What smells affect your emotions strongly?
    - Learn to recognize friends by their scent
    - Use aromas to influence your mood
    - Stop and smell the roses
    - Try different types of cuisine
    - Seek out unusual taste experiences
    - Learn to cook
    - Eat consciously, aware of the taste of your food
    - Avoid eating on the run
    - Participate in taste tests and wine tasting
    - When you go out to eat, identify the ingredients in the dishes served, especially the herbs and spices
- **Touch**
    - Observe the feel of the surfaces that surround you
    - Notice the quality of fabric you wear
    - Learn to touch with sensitivity
    - Pay attention to what it feels like to be touched
    - Ask a companion to assemble a group of objects. Then, while blindfolded, exercise your sense of touch by identifying each object

NOTES

Resources for Living Younger

Web Sites

An Excellent All around Site

- WebMD at www.webmd.com is loaded with feature articles, news items, advice columns, recipes, charts and guides, and links to support groups

The Best Sites for Disease Facts

- www.medlineplus.gov is maintained by the National Institutes of Health (NIH), the world's largest medical research institution
- www.healthfinder.gov is the federal government's gateway to health information on hundreds of topics

Site on Aging

- www.nia.nih.gov/ is maintained by the National Institute on Aging. This site provides surveys, research and health education on aging.

Magazines and Newsletters

- "Nutrition Action Healthletter," published by the Center for Science in the Public Interest, a non-profit health-advocacy group. Suite 300, 1875 Connecticut Avenue, N.W., Washington, DC 20009-5728
- "Consumer Reports on Health," Consumer Reports, P.O. Box 5377, Harlan IA 51593-0877
- "Life Extension," published by the Life Extension Foundation, P.O. Box 229120, Hollywood, FL 33022-9120. A good source for current coverage, including good bibliographic referencing, of research in life extension, but is overly weighted towards supplements.

What's In Any Food?

For the calories, calcium, folate, saturated fat, and other nutrients in any of 10,000 (mostly non-brand name) foods, go to www.nal.usda.gov/fnic/foodcomp

Guide to Pesticides in Produce

- www.foodnews.org

Internet Sources for Recipes

- www.Allrecipes.com
- www.CooksRecipes.com
- www.Meals.com
- www.RecipeSource.com
- www.VegWeb.com

Calorie/Macronutrient Counter

- "The Pocket Protein Counter," Annette B. Natow, Ph.D., R.D., and Jo-Ann Heslin, M.A., R.D., 1997, Pocket Books. This is a convenient, pocket-sized guide to more than 1800 foods. It offers macronutrient information, including total calories, and calories from carbohydrates, protein, and fat.
- "The Nutribase Complete Book of Food Counts," 2001, Avery - Penguin Putnam Inc. Included complete nutrition information for more than 40,000 food products.

Nutritional Supplement Information

1. The Natural Pharmacist (TNP) offers detailed, reliable information about the uses and the safety of nearly 500 dietary supplements. It is prepared by physicians and pharmacists at Healthgate Data Corporation, which supplies medical information to hospitals and pharmaceutical and health insurance firms. TNP is available free at the online supplement vendor www.iherb.com and to subscribers of www.ConsumerLab.com, a site that tests whether supplements contain what their labels claim
2. The FDA's Warnings and Safety Information and Dietary Supplements site lists the supplements that the FDA advises consumers not to use www.cfsan.fda.gov/%7Edms/ds-warn.html

Hormone Replacement Therapy – Controversies

Few topics in medicine have created more confusion for millions of women than the controversies surrounding hormone replacement therapy (HRT). For many years, physicians recommended HRT to menopausal women, based upon studies demonstrating significant health benefits and protection against everything from heart disease and osteoporosis, to colon cancer and Alzheimer's disease. Then, in a sudden about-face, along came a study that lead to a mass discontinuation of HRT. Findings from the Women's Health Initiative (WHI) suggested that the risks associated with HRT use outweighed any benefits. The new evidence showed an increased risk for heart disease, breast cancer and strokes. How could the WHI conclusions about the safety of HRT be so conflicting with previous studies and result in a virtual flip-flop in the medical advice given to women? As the dust has settled and after more in-depth analysis, it appears there is some truth in all the studies. The secret is in understanding what each one is telling us.

Physician guidelines regarding hormone replacement therapy were previously driven by findings from a number of research studies such as the Nurses' Health Study, a 20-year prospective cohort study of 120,000 women. It found that HRT use was associated with significant reductions in cardiac events as well as cardiovascular and total mortality. The more recent Women's Health Initiative, a 5-year randomized trial with 16,000 women, found an increased incidence in cardiac events associated with HRT, although with no increase in either cardiovascular or total mortality. Why are the conclusions at variance? The truth is that the outcomes from both studies were largely correct. They were both right but differed principally in the timing when hormone replacement therapy was initiated. Women in the Nurses' Health Study generally started HRT within 2 years of menopause, while those in the WHI did not start HRT until 10 years after menopause.

Estrogen is thought to have protective properties against cardiovascular disease in premenopausal women, and that the risk for atherosclerosis begins to rise as estrogen levels decline after menopause. Substantial evidence supports the use of hormone replacement therapy for the primary prevention of atherosclerosis in women, but only if started during the early postmenopausal period and before the onset of atherosclerosis. Once atherosclerosis has already developed, however, HRT has no effect at reversing the process and may actually promote plaque destabilization and thrombosis. This largely explains the different outcomes from the Women's Health Initiative compared to earlier studies.

What about an increase in cancer risk with hormone replacement therapy? The WHI consisted of two clinical arms. The first arm was the Hormone Replacement Therapy (HRT) trial, using estradiol (an oral form of estrogen) and progestin (an oral form of synthetic progestin, known as medroxyprogesterone acetate). The Estrogen Replacement Therapy (ERT) trial made up the second arm, using only estrogen. The HRT trial found 8 more cases of breast cancer but 6 fewer cases of colon cancer for every 10,000 women, compared to the control group. On the other hand, women receiving only estrogen in the ERT trial actually demonstrated a small, though not

statistically significant, reduction in breast cancer cases, in addition to fewer cases of colon cancer. Several observational studies also found HRT to be associated with reduced mortality for cancer of the colon. The conclusion from this and previous studies is that the progestin used in the HRT trial of the WHI increases a woman's risk for breast cancer. Progestin appears to be the culprit regarding breast cancer risk, not estrogen. It should be noted that the WHI found no increase in breast cancer deaths or total cancer deaths in either trial. Other recent trials, including the NHANES and USC study, found no evidence of an increased risk for breast cancer.

Of perhaps greater risk for women than breast cancer is osteoporosis. One in six Caucasian women in the U.S. will fracture her hip, and this is greater than the risk of developing breast cancer or gynecological cancer. In white women 50 years and older, the lifetime risk of osteoporotic fractures approaches 40 percent. To make matter worse, as many as 33% of hip fracture patients die within one year of injury. Osteoporosis is responsible for almost 1 million vertebral and hip fractures annually. The Women's Health Initiative demonstrated that hormone replacement therapy is associated with a 35% reduction of hip fractures.

Hormone replacement therapy has beneficial effects in conditions other than cardiovascular disease, cancer, and osteoporosis. Some studies have shown that HRT is associated with a reduction of cases of new-onset diabetes mellitus by as much as 35%, and a 60% reduction in recurrent urinary tract infections. Moreover, it may reduce the risk for Alzheimer's disease. In cell cultures, gender-specific bioidentical estrogen or testosterone supplementation appears to slow the accumulation of tau protein, neurofibrillary tangle, and amyloid in human neurons, reducing the potential for Alzheimer's disease.

Findings from a meta-analysis of 30 randomized controlled trials involving hormone replacement therapy were published in a 2004 issue of the Journal of General Internal Medicine. The report analyzed several notable trials, including the Women's Health Initiative. The authors concluded that while the risks of initiating HRT in older women or in the presence of coronary heart disease may outweigh the benefits, HRT use was not associated with any change in mortality. Furthermore, the authors concluded that the benefits of HRT outweigh the risks if treatment is begun in younger women who do not have coronary heart disease or breast cancer. The report found that initiating HRT in younger postmenopausal women actually resulted in a 39% reduction in mortality.

Current guidelines for hormone replacement therapy have unfortunately confined its use to short-term symptom treatment only, using the lowest dose possible. A better understanding of the seemingly conflicting evidence suggests that hormone replacement therapy provides significant health benefits and disease protection for many women.

A Review of Current Research:

What the studies are saying about Natural Hormone Replacement

Bioidentical Progesterone and Bone

- Bone-forming cells are physiologically influenced by progesterone. (Macnamara P, Loughrey HC. Progesterone receptor A and B isoform expression in human osteoblasts. Calcif Tissue Int 1998; 63:39-46.)
- Progesterone binding to glucocorticoid receptors also may modulate bone loss. Glucocorticoids cause bone loss by blocking osteocalsin synthesis and preventing the attachment of osteoblasts to matrix proteins. Studies indicate that progesterone exerts an antiglucocorticoid effect. (Gronowicz GA, McCarthy M-R Glucocorticoids inhibit the attachment of osteoblasts to bone extracellular matrix proteins and decrease B 1-integrin levels. Endocrinology 1995; 136:598-60K. Prior JC. Progesterone as a bone-trophic hormone. Endocr Rev 1990) 1:386-398.)

Bioidentical Progesterone and Breast Tissue

- Progesterone, at a concentration seen during the third trimester of pregnancy, exhibits a powerful antiproliferative effect on at least two breast cancer cell lines. (Formby B, Wiley TS. Progesterone inhibits growth and induces apoptosis in breast cancer cells: Inverse effects on Bcl-2 and p53. Ann Clin Lab Sci 1998; 28:360-369. Formby B, Wiley TS. Bcl-2 surviving and variant CD44 v7-v10 are down regulated and p53 is up regulated in breast cancer cells by progesterone: Inhibition of cell growth and induction of apoptosis. Mol Cell Biochem 1999; 202:53-61.)

Bioidentical Progesterone and the Heart

- In studies progesterone and 19-nor-progesterone do not illustrate an androgenic action and have no negative effect on lipid levels and vascular reactivity in animal models or on exercise-induced myocardial ischemia in humans. (Sitruk-Ware R. Progestins and cardiovascular risk models. Steroids 2000; 65:651-658. Chan HY, Yao X. Different role of endothelium/nitric oxide in l1B-estradi01 and progesterone-induced relaxation in rat arteries. Life Sci 2001; 69: 1609-1617.)
- One study showed progesterone caused coronary relaxation by inhibiting Ca++ mobilization into coronary smooth muscle. (Crews JK, Khalil RA. Antagonistic effects of 17B-estradiol, progesterone, and testosterone on Ca++ entry mechanisms of coronary vasoconstriction. Arterioscler Thromb Vasc Bioi 1999; 19: 1034-1040.)
- Another study assessed the use of natural progesterone with estradiol. Experts found that progesterone did not have a detrimental vascular effect. (Mather KJ, Norman EG, Prior JC et al. Preserved forearm endothelial responses with 3Cnte exposure to progesterone: A randomized cross-over trial of 17B-estradiol, progesterone and HB-estradiol with progesterone in healthy menopausal women. J Clin Endocrinol Metab 2000; 85:4644-4649.)
- Researchers have found that progesterone reduces platelet aggregation via the enhancement of nitric oxide, which is an endothelium-derived relaxing factor.

(Jiang C, Sarrel PM, Lindsay DC, et at Progesterone induces endothelium-independent relaxation of rabbit coronary artery in vivo. Eur J Pharmacol 1992; 211:163-167. Molinari C, Battaglia A. Effect of progesterone on peripheral blood flow in prepubertal female anesthetized pigs. J Vasc Res 2001; 38: 569577.)

Bioidentical Progesterone and the Brain

- The formation of myelin sheaths is enhanced by progesterone administration. (Schumacher M, Baulieu EE. Neurosteroids: Synthesis and functions in the central and peripheral nervous systems. Civa Found Symp 1995; 191:90-106; discussion 106-112.)

Bioidentical Estrogen and the Heart (including estradiol, estrone, estriol)

- In a 12 week randomized, double-blind, placebo controlled crossover study 31 women found that estradiol did not negatively affect cardiac structure or function in normal postmenopausal women. (Snabes MC, Payne JP, Kopden HA et at Physiologic estradiol replacement therapy and cardiac structure and function in normal postmenopausal women: A randomized double-blind, placebo-controlled, crossover trial. Obstetrics & Gynecology 1997; 89:332-339.)
- 12 women with confirmed coronary artery disease were given sublingual estradiol or placebo 40 minutes prior to treadmill exercise test. The researchers concluded that estradiol could lessen myocardial ischemia by reducing myocardial oxygen consumption through a decrease in peripheral vascular resistance or by lowering preload. It may also have a direct vasodilator effect on coronary arteries. (Rosano GMC, Sarrel PM, Poole-Willson PA et al Beneficial effect of estrogen on exercise induced myocardial ischemia in women with coronary artery disease. The Lancet 1993; 342: 133- 136.)
- Over a one-year period 63 women were given either oral estradiol or transdermal estradiol. The study shows that both oral and transdermal were identical in their ability to reduce carotid and uterine artery resistances to blood flow. The researchers concluded that this long-term vascular effect might explain how estradiol protects women from cardiovascular disease. (Cacciatore B, Paakkari I, Toivonen Jet at Randomized comparison of oral and transdermal hormone replacement on carotid and uterine artery resistance to blood flow. Obstetrics &Gynecology 1998; 91(4 Pt 1):563-568.)
- Riedel and colleagues measured how estradiol, over placebo and basal measurements, in 23 postmenopausal women induced vasodilation of the femoral artery. (Riedel M, Oeltennann A, Mugge A. et at Vascular responses to 17B-estradiol in postmenopausal women. European Journal of Clinical Investigation 1995; 25:44-47.
- Estrogen has many positive effects on lipid metabolism. It reduces low-density lipoprotein (LDL) and very-low-density (VLDL) lipoprotein cholesterol levels.
- In a double-blind, placebo-controlled crossover study, Haines and colleagues observed a 9.62% reduction in values of Lipoprotein (a), a risk factor for cardiovascular disease, with estradiol treatment compared with the placebo group. No major side effects were noted. (Haines C, Chung T, Cbang A. et at Effect of oral estradiol on Lp (a) and! other lipoproteins in postmenopausal

women. A randomized, double-blind placebo-controlled, crossover study. Archives of Internal Medicine. 1996; 156:886-872.)

- Administration of estriol significantly ($p<0.05$) decreased 24-hour systolic and diastolic blood pressure and did not cause negative side effect. (Mercuro G, Zoncu S, Piano D et at Estradiol-I7 beta reduces blood pressure and restores the normal amplitude of the circadian blood pressure rhythm in postmenopausal hypertension. American Journal of Hypertension 1998; ll (8Pt 1):909-913.)
- Oral estradiol compared to placebo in a group of 29 women each showed a significant decrease of 5 mm Hg. An increase was shown in the placebo group. (Van Ittersum F J, Van Baal WM, Kenemans P et al. Ambulatory – not office blood pressures decline during hormone replacement therapy in healthy postmenopausal women. American Journal of Hypertension 1998: II: 1147-1152.)

Bioidentical Estrogen and Diabetes

- Estrogen administered transdermally or orally, improves sensitivity in the level, glycemic control, lipoprotein profiles and fibrinolysis in postmenopausal women with non-insulin-dependent diabetes mellitus. (Brussard HE, Gevers JA, Frolich M et al. Short-term estrogen replacement therapy improves insulin resistance, lipids and fibrinolysis in postmenopausal women with NIDDM. Diabetologia 1997; 40:843-849. O'Sullivan AJ, Ho KK. A comparison of the effects: of oral and transdermal estrogen replacement on insulin sensitivity in postmenopausal women. Journal of Clinical Endocrinology and Metabolism 1995; 80: 1783-1788.)

Bioidentical Estrogen and Bone

- Estradiol and estriol have both been shown to have a positive effect on bone mineral density in both oral and transdermal forms.
- A study compared oral conjugated estrogen and transdermal estradiol per day on biochemical markers of bone resorption in 60 healthy menopausal women. Both therapies were equally effective in that they decreased hydroxyproline/creatine ratios as well as pyridinoline/creatine ratios. (Reginster JY, Christiansen C, Dequinze B et al. Effect of transdermal 17 beta-estradiol and oral conjugated equine estrogens on biochemical parameters of bone resorption in natural menopause. Calcified Tissue International 1993; 53:13-16.)
- In a double-blind, placebo-controlled study 41 postmenopausal women were put on micronized estrogen and calcium carbonate or a placebo. Using bone-density measurements they concluded that estradiol has a continuous skeletal dose-response effect and that the calcium boost positively modified the skeletal response. No serious side effects were noted. (Ettinger B, Harry K, Steiger P et al. Low-dosage micronized 17B-estradiol prevents bone loss in postmenopausal women. American Journal of Obstetrics & Gynecology 1992; 166:749-4188.)
- Women with bone-status problems have also been monitored in studies regarding estrogen replacement. Topical estrogen was shown to prevent spinal bone loss at all postmenopausal ages and is capable of doing this at lower dosages. No significant side effects were noted. (Evans SF, Davie MW. Low

and conventional dose transdermal estradiol are equally effective at preventing bone loss in the spine and femur at all post-menopausal ages. Clinical Endocrinology 1996; 44:79-84.)

- Estriol, bolstered by calcium, has also been shown to increase bone mineral density, over a 50-week period, by 1.79% compared to pretreatment base measurements. (Minaguchi H, Demura T, Shirasu K. et al. Effect of estriol on bone loss in postmenopausal Japanese women: A multi-center prospective open study. Journal of Obstetric & Gynecologic Research 1996; 22:259-265.)

Bioidentical Estrogen and the Skin

- In a study, 59 women applied estradiol or estriol to facial skin. After six months, elasticity and firmness of the skin had markedly improved and the wrinkle depth and pore sizes decreased by 61 percent or more in both estradiol and estriol groups. Skin moisture and the number of collagen fibers had increased. No side effects were noted. (Schmidt JB, Binder M, Demschik G et al. Treatment of skin aging with topical estrogens. International Journal of Dermatology 1996; 35:669-674.)

Bioidentical Estrogen and the Brain

- Women are 2 to 3 times more likely than men to suffer from Alzheimer's disease (AD).
- Alzheimer's disease is not completely understood and we're not entirely sure how or why it happens. However, we do know that a major component of Alzheimer's disease is an accumulation intracranially of B-amyloid, a proteolytic fragment. As the disease advances, neurofibrillary tang1es and neuritic plaques develop specifically in the cerebrum and the level of acetylcholine (Ach), a neurotransmitter responsible for memory, decreases.
- Research indicates that estrogen blocks B-amyloid-induced neuronal cell death via estrogen receptor-a (ER-a) -dependant pathways. (Kim H, Bang OY, Jung MW et al. Neuroprotective effects of estrogen against beta-amyloid toxicity are mediated by estrogen receptors in cultured neuronal cells. Neuro Sci Lett 2001; 302:58-62.)
- Estrogen appears to enhance the clearance of B-amyloid through microglia, which are key components of the immune system that remove B-amyloid deposits from the brain. (Li R, Shen Y, Yang LB, et al. Estrogen enhances uptake of amyloid beta-protein by microglia derived from the human cortex. J Neurochem 2000; 75:1441-1454.)
- Both B-amyloid and B-amyloid-AchE complexes are ameliorated by estradiol therapy, which provides protection against amyloid-induced toxicity at the cellular level. (Bonnefont AB, Munoz FJ. lnestrosa NC. Estrogen protects neuronal cells from the cytotoxicity induced by acetylcholinesterase-amyloid complexes. FEBS Lett 1998; 441:220-224.)
- B-amyloid induces an inflammatory response in the brain, which is a large part of the pathologic effect of AD. Some studies have shown that estradiol may inhibit the inflammatory responses by suppressing the homing and activation of inflammatory cells. (Salem ML, Hossain MS, Nomoto K. Mediation of the

immunomodulatory effect of beta-estradiol on inflammatory responses by inhibition of recruitment and activation of inflammatory cells and their gene expression of TNF-alpha and IFN-gamma. Int Arch Allergy lmmunol 2000; 121:235-245. Cushman M, Legault C. Barrett-Connor E, et al. Effect of postmenopausal hormones on inflammation-sensitive proteins: The Postmenopausal Estrogen/Progestin Interventions (PEPI) Study. Circulation 1999; 100:717-722. Bruce-Keller AJ, Keeling JL, Keller jN, et al. Anti-inflammatory effects of estrogen on microglial activation. Endocrinology 2000; 141:3646-3656.)

- AD can cause an upregulation of proinflammatory cytokines – interleukin-1 (IL-1) and interleukin-6 (IL-6). Nitric oxide has the ability to decrease the level of IL-6 in the brain. Estrogen can block IL-6 production by promoting vascular NO synthesis. (Knoferl MW, Diodato MD, Angele MK, e1 al. Do female sex steroids adversely or beneficially affect the depressed immune responses in males after trauma-hemorrhage? Arch Surg 2000; 135:425-433.)
- The formation of axodendritic and spinal synapses is facilitated by estrogen. Apolipoprotein E has an important role in regenerating synaptic circuitry after neural injury. The combined effect of apolipoprotein E and estrogen modulates the neurologic effect of AD. (Matusmoto A, Arai Y. Synaptogenic effect of estrogen on the hypothalamic arcuate nucleus of the adult female rat. Cell Tissue Res 1979; 198:427 -433. Matusmoto A, Arai Y. Neuronal plasticity in the deafferented hypothalamic arcuate nucleus of adult-female rats and its enhancement by treatment with estrogen. J Comp Neurol l981; 197:197-205. Teter B, Harris-White ME., Frautschy SA, et al. Role of apolipoprotein E and estrogen in mossy fiber sprouting in hippocampal slice cultures. Neuroscience 1999; 91:2009-1016.)
- Estrogen increases the density of dendritic spines on CA 1 pyramidal cell dendrites and increases the number of spinal synapses. Estrogen may also be involved in the formation of synaptic connections between previously unconnected hippocampal neurons. (Yankova M, Hart SA, Wooley CS. Estrogen increases synaptic connectivity between single presynaptic inputs and multiple postsynaptic CA pyramidal cells: A serial electron-microscopic study. Proc Natl Acad Sci USA 2001; 98:3525-3530.)

A Review of Current Research:

What the studies are saying about Conventional Hormone Replacement

Progestin and Breast Tissue

- Medroxyprogesterone acetate or norethindrone occupy the progesterone receptor site and inhibit the binding of endogenous progesterone to the receptor. This chemically induced progesterone deficiency may increase the risk of breast cancer because the BCL2 gene is up regulated by estradiol with no corresponding down regulation opposing that action.
- Breast epithelial cell proliferation is greater when a combination of estrogen and medroxyprogesterone acetate (like Provera) is used than with estrogen alone or nothing at all. (Hofseth L, RaafatA, Osuch JR, et al. Hormone replacement therapy with estrogen or estrogen plus medroxyprogesterone acetate is associated with increased epithelial proliferation in the normal postmenopausal breast. J Clin Endocrinol Metab 1999; 84:4559-4565.)
- A study showed how four different topical regimens: estradiol alone, progesterone alone, progesterone plus estradiol, or a placebo, affected the breast tissue. Estradiol alone increased the proliferation index of breast epithelium 100-fold, the use of progesterone alone increased the proliferation index 15-fold, and the combination treatment increased the proliferation index 13-fold. (Foidart JM, Colin C, Denoo X, et al. Estradiol and progesterone regulate the proliferation in the normal post-menopausal breast. J Clin Endocrinol Metab 1999; 84:4559-4565.)
- During the Women's Health Initiative trials the breast cancer risk was 26 percent higher in the treatment group (group using Prempro) than the control group. (Writing Group for the Women's Health Initiative Investigators. Risks and Benefits of Estrogen Plus Progestin in Healthy Postmenopausal women. JAMA 2002; 288.321-333.)

Progestin and the Heart

- The American Heart and Estrogen/Progestin Replacement Study (HERS), a large multicenter randomized study, showed that the addition of progestin (a synthetic hormone) to estrogen increased the risk of events related to coronary heart disease during the first year of treatment. (Kuttenn F, Gerson M. Hormone replacement therapy of menopause, heart and, blood vessels. Arch 'Mal Coeur Vaiss 2001; 94:685-689.)
- During the Women's Health Initiative trials the heart attack risk was 29 percent higher in the treatment group (group using Prempro) than the control group. (Writing Group for the Women's Health Initiative Investigators. Risks and Benefits of Estrogen Plus Progestin In Healthy Postmenopausal Women. JAMA 2002; 288:321-333.)
- During the Women's Health Initiative trials the stroke rate was 41 percent higher in the treatment group (group using Prempro) than the control group. (Writing Group for the Women's Health Initiative Investigators. Risks and Benefits of Estrogen Plus Progestin in Healthy Postmenopausal Women. JAMA 2002; 288:321-333.)

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