

Chapter 8

Nutraceuticals

"The Mesua RX products giving you the fountain of health and youth from the inside out"

Nutraceuticals can be broadly defined as components of foods or dietary supplements that have a medicinal or therapeutic effect.

In general, nutraceuticals are taken in amounts higher than what can be obtained from a regular diet.

—ARTHUR ROBERTS, M.D.

Our bodies require oxygen for metabolism. Without oxygen we cannot produce energy, but a downside of this energy production is its generation of free radicals and inflammation, so one of the main keys to achieving good health is to maintain the right balance of free radicals and antioxidants.

Nutraceuticals are components of foods or dietary supplements that support healing. They include antioxidants, amino acids, enzymes, fish oils, herbs, minerals, and vitamins. Many of these nutrients and antioxidants can penetrate into cells and prevent free-radical damage while simultaneously decreasing inflammation in the body.

TEN PRINCIPLES OF CELLULAR HEALTH AND NUTRACEUTICALS

The following principles are modified from Dr. Matthias Rath's original ideas detailed in *The Heart*.

1. Health and disease are determined by the vitality of the 60 trillion cells that make up our bodies and the various organs comprising them.
2. Nearly all diseases develop within organs at the cellular level. Inflammation is a major cause of most chronic disease.
3. Essential nutrients are needed for the thousands of biochemical reactions in each cell and to minimize the effects of inflammation.
4. The primary cause of cellular malfunction is a deficiency of vitamins, minerals, hormones, and other nutrients required for cell fuel.

5. Stress and aging (both mental and physical) will change the demand for nutrients required by the various cells of organs.
6. Nutrients are also required in different amounts, as determined by an individual's genetic predisposition.
7. Cardiovascular and neurological complications are the most prevalent of all ailments because those cells consume vitamins and other essential nutrients at a higher rate than the cells of other organs.
8. Medi-spas, which integrate the best of both conventional and alternative treatments while focusing on the individuality of each client, are the ideal sites to optimize cellular health.
9. Dietary supplementation with enzymes, hormones, vitamins, and other nutrients is a key process in the prevention and treatment of cardiovascular conditions and other chronic diseases associated with aging.
10. Core nutraceuticals, containing antioxidants, enzymes, minerals, omega-3 fatty acids, and vitamins, should be consumed daily by all individuals. In addition, target nutraceuticals aimed at specific problems should also be taken to help support cell function while correcting cell malfunction in any diseased organs.

THE EMERGENCE OF NUTRACEUTICALS

In the United States, the profit motive often dictates the direction of scientific research. Unlike drugs, nutraceuticals are most often derived from natural products that in most instances cannot be patented. This greatly reduces the financial incentive for a drug company to proceed with years of research and marketing. Most nutraceutical research today is carried out abroad, led by Germany, where about 70 percent of physicians prescribe from about 600 different botanical medicines. Today drugs are a multibillion dollar industry; however, the pendulum is beginning to swing the other way.

The rediscovery of botanical medicine and the emergence of nutraceuticals are helping to redefine health care in the United States and other countries. More and more consumers have noticed their benefits are largely free of the side effects associated with many types of drugs.

Over the past twenty-five years, in our own practices in cardiology, internal medicine, and plastic surgery, we have seen countless patients benefit from taking nutraceuticals. For a majority of nonacute health conditions, we prescribe nutraceuticals and lifestyle changes as first-line therapies, looking to drugs only if these approaches are not effective.

We would like to introduce you first to new research on antioxidants and then cite the brain as a specific example of how targeted nutraceuticals can improve your health and longevity.

I. ANTIOXIDANTS LEAD THE WAY TO A NEW UNDERSTANDING

We now stand at the threshold of a new understanding of how antioxidants can affect the quality and length of human life, thanks largely to such people as Professor Lester Packer, Ph.D., author of *The Antioxidant Miracle*. He and others have made startling new discoveries on how antioxidants can prevent and treat many chronic and degenerative diseases, including arthritis, cancer, cataracts, and heart disease.

Dr. Packer's conclusions concerning the antioxidant effects that increase longevity include:

- Improving concentration and reversing age-related memory loss;
- Protecting against prostate and other cancers;
- Rejuvenating an aging immune system;
- Relieving arthritis and other inflammatory conditions;
- Reversing age spots and protecting against skin cancer;
- Supporting cardiovascular function;
- Turning off *bad* genes.

Antioxidant supplements are readily available, and you are probably taking them, but you may not be taking them correctly. Recently, scientists discovered a dynamic interplay among certain key antioxidants, a relationship Dr. Packer calls *the antioxidant network* because they work in concert to greatly enhance one another's power. What makes network antioxidants special is that they can extend their antioxidant power by recycling or regenerating one another after they have quenched dangerous free radicals. As Dr. Packer states, "The primary job of the antioxidant network is to prevent antioxidants from being lost through oxidation. As one network antioxidant saves the other, the cycle continues, ensuring the body will maintain the right antioxidant balance."

Although there are hundreds of antioxidants, Dr. Packer has identified these five as foundation network antioxidants:

1. Alpha-lipoic acid
2. Coenzyme Q₁₀
3. Glutathione
4. Vitamin C
5. Vitamin E

It is interesting to note that all these foundation antioxidants support the inner mitochondrial membrane. Whenever we protect the mitochondria (the cell's engine), we stabilize the integrity of the cell and probably extend its life.

Dr. Suarez-Menendez feels that one of the major causes of congestive heart failure in older people is mitochondrial dysfunction of heart cells leading to impaired contraction in the heart. As an antidote to this, he has been recommending coenzyme Q₁₀ to his patients for more than twenty years.

Oxidation—A Paradox of Life and Death

As stated previously, the body requires oxygen for metabolism, to produce energy and sustain life. Unfortunately, free radicals, those molecular snipers that roam the body in search of electrons that will neutralize their charge, are byproducts of oxidative processes and cause cellular damage. An essential means of cultivating good health involves balancing antioxidants and free radicals, and this is what your body's antioxidant defense system does.

Dr. Bruce Ames, a well-known antioxidant scientist, estimates that each human cell gets about 10,000 oxidative *hits* daily to its DNA. If you multiply this by the trillions of cells in the body, you can see how it can add up to a big problem. Free radicals not quickly reined in can cause a great deal of trouble and this is why supplements with antioxidants are indispensable for longevity. When your antioxidant defenses are overwhelmed by a firestorm of free radicals, the condition known as oxidative stress exists. In order to sustain optimum health, you must have enough antioxidants available to handle the free-radical oxidative stress that occurs to a greater or lesser degree every second of your life.

To better understand the process of oxidation, think about the leftovers you wrap up after a meal. One of the reasons wrapping helps is that it keeps oxygen from attacking the leftovers. Although food chemists had long recognized that certain vitamins were good food preservatives and began to call them antioxidants, it did not initially occur to anyone that the same process occurring to the leftover food was occurring in our own bodies.

As we age, the levels of antioxidants fall and the network antioxidants (see Table 8.1 on page 151) become overwhelmed by the gradually increasing toxic load on the body. Interestingly, humans and elephants have the highest concentration of antioxidants and the longest life spans, while rats and other rodents have the lowest levels and the shortest life spans.

The Antioxidant Network

The following is a summary of the beneficial effects of the five network antioxidants from *The Antioxidant Miracle*, by Dr. Packer, modified with our comments and suggestions.

TABLE 8.1. Network Antioxidants

FAT-SOLUBLE ANTIOXIDANTS <i>(Protect fatty part of cell membranes)</i>	WATER-SOLUBLE ANTIOXIDANTS <i>(Protect watery part of cell membranes)</i>
Vitamin E	Vitamin C
Coenzyme Q ₁₀	Glutathione
Alpha-lipoic acid*	Alpha-lipoic acid*

*Alpha-lipoic acid is unique and can function in both zones, regenerating fat- and water-soluble antioxidants.

Source: The Antioxidant Miracle

1. Alpha-Lipoic Acid

- Protects against three common age-associated diseases: cataracts, heart disease, and strokes.
- Strengthens memory and prevents brain aging.
- Helps to reduce blood sugar.
- Boosts the entire antioxidant network by helping to recycle oxidized vitamins C and E and coenzyme Q₁₀.
- Can prevent and relieve the complications of diabetes.
- Turns off *bad* genes that accelerate aging, cancer, and polyneuropathy (inflammation of all the nerves of the body).
- Can reverse mushroom poisoning of the liver.
- Has been useful in treating liver disease, such as hepatitis C.
- Reduces advanced glycolation end products (AGES) and helps skin.
- Strengthens the immune system.
- Prevents replication of HIV in cultured human cells.
- Protects against radiation poisoning.

A Note for Smokers

Smoking probably shortens your life by about eight years. Obviously, the best advice is to quit. It might be possible to reduce the diseases associated with cigarette smoke by bolstering network antioxidants, especially lipoic acid. Gamma tocopherol (vitamin E) also appears to be protective for smokers, and since smoking causes a drastic reduction in vitamin C, it should be supplemented as well. We don't, however, recommend beta-carotene in doses greater than 10,000 units for smokers, as high doses of it may enhance lung cancer in them.

RDA: Not established

Recommended amount: 50–100 milligrams

Sources: Synthesized by body but levels fall off with age. Present in small amounts in animal products, especially red meat.

2. Vitamin E

- Reverses the age-related slump in immune function.
- Protects your brain from aging.
- Protects your lungs from automobile emissions.
- Reduces risk of gastrointestinal cancer in both men and women.
- Reduces your risk of strokes and heart disease.
- Protects your skin from UV rays and ozone.
- Relieves arthritis and other inflammatory diseases.
- Reduces risk of prostate cancer in men.
- Reduces risk of breast cancer in women.
- Helps save your vision by preventing cataracts.

RDA: 30 IU daily

Recommended amount: 100–200 IU mixed tocopherols and tocotrienols

Sources: Barley, extra virgin olive oil, leafy vegetables, nuts, rice bran oil, wheat germ.

A Note for Living Better Longer

In studies on human cells, scientists have evidence that vitamin E can prevent aging at the cellular level, where aging begins. Long before we see the more visible signs of gray hair and wrinkles, subtle changes are occurring in our cells. One of the telltale signs of aging is the accumulation of the pigment lipofuscin, especially in the brain and heart. Vitamin E has been shown to prevent cells from accumulating this aging substance in cultured human cells.

3. Vitamin C

- Protects you from heart disease.
- Reduces risk of cancer.
- Protects sperm from free-radical damage.
- Regenerates used-up vitamin E.

- Boosts the immune system.
- Reduces the length and severity of colds.
- Keeps skin young and supple, particularly the fat-soluble form of ascorbyl palmitate.
- Vitamins C and E prevent the oxidation of harmful LDL lipoproteins.
- Protects against cataracts.

RDA: 60 milligrams (100 milligrams for smokers)

Recommended amount: 200–400 milligrams

Sources: Abundant in many fruits and vegetables, including broccoli, cabbage, citrus fruit, cranberries, potatoes, red peppers, and tomatoes.

An Evolutionary Note

Humans (as well as bats and guinea pigs) are one of the few animals that don't produce vitamin C. Some scientists believe that the loss of the necessary enzyme about 45,000 years ago was an evolutionary error. The average foraging gorilla will consume about 5,000 milligrams of vitamin C per day. If a rat were a 170-pound man, it would make about 5,000 milligrams per day, an amount that some believe is closer to an optimal dose for humans. The stress of today's living requires taking more than the woefully inadequate RDA of vitamin C. Smokers, older people, anyone with diabetes, and women on oral contraceptives, all require at least 200 milligrams of vitamin C per day.

4. Coenzyme Q₁₀

- Regenerates vitamin E in the antioxidant network.
- Can prevent and help reverse some heart diseases.
- Can help manage type-2 diabetes.
- Can help improve Parkinson's disease.
- May help prevent Alzheimer's disease.
- May help treat breast cancer.
- Can help treat gum disease.
- Can reduce fatigue.
- Can improve male fertility.

RDA: Not established

Recommended amount: 30–100 milligrams (150–250 milligrams if taking a statin drug)

Sources: Synthesized by the body; also found in seafood and organ meats.

An Historical Note

Coenzyme Q₁₀ was discovered by Professor Fred Crane at the University of Wisconsin in 1957. Renowned scientist Karl Folkers, who was the first researcher to identify the structures of vitamin B₆ and B₁₂, isolated coenzyme Q₁₀ from beef hearts in 1958 while working at Merck, Sharpe and Dohme. Although recognizing its importance, Merck sold the technology to the Japanese in 1965. Dr. Folkers continued his research at the University of Texas and was the first to suggest that the age-related decline in coenzyme Q₁₀ was a contributing factor in many age-related diseases, including heart disease, cancer, and Alzheimer's disease. He reasoned that since high-energy bonds are so important to the function of virtually every cell in the body, it is impossible for any body system to run well if it is not getting adequate fuel. Since coenzyme Q₁₀ helps support the formation of adenosine triphosphate (ATP)—the essence of the body's energy—coenzyme Q₁₀ will help rescue almost any tissue in need.

The L-Carnitine Connection to Coenzyme Q₁₀

A vital sidekick to coenzyme Q₁₀ is L-carnitine, an amino acid found primarily in meat, most often lamb. Because it has a special relationship with coenzyme Q₁₀, we highly recommend this multitasking nutraceutical in doses of 75–150 milligrams per day. Together, coenzyme Q₁₀ and L-carnitine act synergistically to burn fats inside the mitochondria, the furnaces of the cells, and this helps the body's energy network function at a highly favorable level, especially in the heart, which derives more than 60 percent of its energy from burning fat.

5. Glutathione

- Important for longevity.
- Recycles vitamin C.
- Can be boosted by lipoic acid.
- Detoxifies drugs and toxins.

- Important for healthy liver function.
- Boosts immunity.
- Helps store and transport amino acids.
- Can help turn off the inflammatory response.
- Forms glutathione peroxidase, the body's most important defense against arteriosclerosis.
- Can be synthesized from the metabolism of N-acetylcysteine (NAC), which is the breakdown product of glutathione. (Oral forms of glutathione are not well absorbed.)

RDA: Not established

Recommended amount: 50 milligrams alpha-lipoic acid daily (as above) and 50 milligrams NAC.

Sources: Abundant in fruits, vegetables, especially avocados, and freshly cooked meats.

A Note on the Master Antioxidant

Glutathione is the cell's primary antioxidant and is found in the watery portion of the cell. Glutathione is produced in the cells from three amino acids—cysteine, glutamic acid, and glycine. Glutathione is the only network antioxidant most experts do *not* recommend supplementing with, due to the fact that it is broken down and no one knows how much glutathione actually passes through the intestinal wall into the cells. Alpha-lipoic acid and NAC will boost glutathione levels in target tissues where it is needed. The B vitamins and such minerals as calcium, magnesium, and selenium also boost antioxidant levels when consumed daily. Adding antioxidants to your wellness and longevity program can help you "To die as young as possible as old as possible," as the Greeks used to say.

The easiest way to take nutraceuticals is in packet form. As part of the Zone Foundation Program, we recommend a multivitamin/mineral combination with added enzymes, omega-3 fatty acids, and an antioxidant cocktail (see Table 8.2 on page 156). Although an extra evening dose is a suggested way to take supplements, we understand that people often dislike taking multiple numbers of tablets and capsules. They also want to avoid the extra cost, so a minimum of one packet a day to start is strongly recommended.

TABLE 8.2. Basic Antioxidant Cocktail

Mixed carotenoids	5,000 IU	Vitamin B ₁₂	300 mcg
Vitamin E	200 IU mixed tocopherols and tocotrienols	Vitamin B ₆	2 mg
Coenzyme Q ₁₀	30 mg	L-carnitine	75 mg
Alpha-lipoic acid	50 mg	Magnesium	200 mg
Vitamin C	200 mg	Calcium	500 mg
Folic acid	800 mcg	Selenium	100 mcg
		Zinc	15 mg

II. BRAIN HEALTH

Many express surprise when they meet someone in their seventies, eighties, or beyond, who is sharp as a tack. While the brain is especially susceptible to the damaging effects of free-radical stress, it is also one of the body's most plastic structures—that is, it is able to respond to targeted nutritional supplements as well as mental stimulation for a lifetime. When it comes to your brain, it's a clear case of use it or lose it. In this section, we'll briefly touch upon the most important nutraceuticals for optimal brain health.

Together with heart disease, memory loss is one of the biggest concerns of our aging population. The most beneficial aspects of aging are wisdom and experience, but the downside of aging is that things we used to take for granted now seem to be changing in a manner that often makes us feel old. Sometimes mental acuity, brain processing, and short-term recall of faces, information, names, numbers, and words are not as quick as they used to be, and some of us accept this age-related memory and cognitive decline as inevitable and natural. This is not necessarily so, and it certainly is not necessarily an early symptom of dementia or Alzheimer's disease. It may be due to age-related factors, but it can also be caused by depression, various medications, or such medical conditions as a low thyroid, a deficiency of vitamin B₁₂, or elevated homocysteine levels.

The first thing to do, even if you have not noticed any symptoms of brain-drain, is check your brain-processing functions to determine what your current level of brain capacity is. You can do this online with an easy, simple brain test called BrainCHECK (www.brain.com).

Our brains are unlike any of our other organs because each tiny region has a very specialized function that is not duplicated anywhere else. That means, if we sustain an injury to a very small area of our brain, we can end up with damage that can severely compromise our ability to function. Even with all our high-tech

super computers, the brain is still the most efficient and complicated computer of all. It has yet to be duplicated and it can't be transplanted. Therefore, we must do everything possible to prevent it from becoming damaged.

In order to do that, we must first have a basic understanding of how the brain and nerve cells function. An individual brain cell, or nerve cell, is called a neuron. It has a body in it that receives information from other neurons and, in turn, produces a response that is sent out to other nerve cells or muscles to trigger a body function, such as a thought, movement, vision, smell, taste, tears, and perspiration. Neurons receive information through thousands of little biochemical processes, with the roots (dendrites) attached to the cell body. Information is sent out from the neurons by a long extension of each cell called the axon (only one axon to a neuron), and it is best visualized as a copper wire with insulation, called *myelin*, wrapped around it. Myelin is essential for most nerve cells to conduct electricity normally. The axon then makes contact with another cell, of one type or another, through a junction box called a synapse. It communicates with the next cell down the line by releasing a chemical messenger into the synapse that, in turn, activates that cell. These chemical messengers are called neurotransmitters. One nerve cell can be connected to thousands of other nerve cells through the dendrites (treelike structures in the nerve cells).

The brain has certain basic needs in order to function. First, it needs fuel and that is glucose. The brain cannot survive long without glucose, and glucose deprivation in such conditions as hypoglycemia (low blood sugar) can cause significant brain damage after only a short period of time. Second, it needs to burn the glucose fuel, and for this it needs oxygen, which is carried to it through the cerebral blood vessels—the carotid and vertebral arteries. For our brain to work, our heart must pump blood to it, and to do that, our arteries must be open so the blood can reach the brain. If either of these systems (blood or oxygen) malfunctions, the brain can be permanently damaged in as short a time as five minutes. Third, it needs amino acids, electrolytes, fatty acids, hormones, minerals, and vitamins in order to manufacture neurotransmitters, stabilize electrical connections, maintain metabolic functions and myelin, and strengthen cell walls. Since many of these brain nutrients decline as we age, we need supplementation to replace them.

In order to prevent memory and cognitive loss, it would help to first know what causes it. There are many theories, the most popular of which has to do with oxidative free-radical damage to cells and cell membranes. Oxidation of fatty acids in the walls of nerve cells and damage to the mitochondria (the pow-

erhouse of the cell) tend to cause an accumulation of damaged materials, a loss of dendrites, sick and dying cells, and ultimately cell death. Depending on which regions are damaged, this could manifest as Alzheimer's disease or Parkinson's disease. Other theories involve programmed cell death, or the formation of neurotoxins from ingested materials in food, water, and the atmosphere. And, if not recognized, deficiencies of one or more brain nutrients can also result in memory loss and eventual cell death, plus any accumulation of tiny small infarcts (strokes) will eventually result in decreased memory and ability to think clearly.

Still another school of thought is that memory loss and Alzheimer's disease are due to lifestyle. In his book *Brain Longevity*, Dharma Singh Khalsa, M.D., says that chronic stress causes continued excessive concentrations of cortisol in the body, and this is toxic to brain cells. We agree that reducing your stress and maintaining a balanced and happy spirit are critical to preserve a well-functioning mind, and we believe that, by lowering stress-induced cortisol levels, you can help slow down brain aging, especially Alzheimer's disease.

This prevalent disease has been estimated at 50 percent in individuals eighty-five years or older—the most rapidly growing segment of our population. Whatever the ultimate causes of Alzheimer's disease may be, symptoms of the disease arise when neurons that are damaged or destroyed by free radicals (generated by inflammation) fail to function.

The Importance of Enhancing Brain Function as We Age

The question arises as to when you should start taking compounds to help preserve and heighten cognitive skills. The answer is the earlier the better. Our philosophy is preventive medicine. Once you have been diagnosed with dementia, there is very little, if anything, you can do to effectively slow or reverse the process. So do whatever you can, as early as possible, to enhance, maintain, and retain your brain—without cognitive function, the quality of life descends to a much lower level.

We know there is no fountain of youth, but there are new and emerging compounds that may possibly slow, or even reverse, the memory impairment that can eventually progress to Alzheimer's disease or dementia. Our first priority is to preserve and maintain your self-image and your quality of life for as long as possible. Effective Alzheimer's therapy needs to:

1. Reduce inflammation;
2. Limit the damage of free radicals;
3. Enhance neural function.

1. Reducing Inflammation

Fish oil. Manipulation of dietary fat is a proven method of reducing inflammation. Dietary changes designed to decrease arachidonic acid (by eating less meat and eggs) and increase omega-3 levels have been effective strategies for curtailing inflammatory conditions, including arthritis, multiple sclerosis, and psoriasis. The best source of omega-3s is pharmaceutical grade (purified of toxins) fish oil, the potency of which is determined by its DHA content. Borage seed oil and black currant oil are other sources of activated omega-6 fatty acids, and their potency is determined by the GLA content. Magnesium, vitamin B₃, vitamin B₆, and zinc intensify the anti-inflammatory effects of both essential fatty acids.

Recommended dose: 4 capsules **Mesua RX** daily

1,600 milligrams EPA (eicosapentaenoic acid)

800 milligrams DHA (docosahexaenoic acid)

Polyphenols. These are potent free-radical fighters that can help prevent inflammation. They are present in small amounts in most fruits and vegetables, and are abundant in grape seeds and pine bark (Pycnogenol). Polyphenols are excellent for the health of the brain as they can readily cross the blood-brain barrier to nurture brain tissues and diminish inflammation.

Excellent dietary sources include berries, dark vegetables, green tea, red wine, soybeans, and such herbs as bilberry, ginkgo biloba, and milk thistle.

Recommended dose: 120 milligrams Pycnogenol

120 milligrams grapeseed extract

2. Limiting Free-Radical Activity

Alpha-lipoic acid. Lipoic acid is an extremely powerful antioxidant as it is both fat and water soluble, and may therefore freely enter all parts of the cells. It is rapidly absorbed and readily enters the brain to protect neurons from free-radical damage. Further antioxidant protection is derived from its ability to recycle vitamins C and E and regenerate glutathione, one of the brain's most important antioxidants. Lipoic acid also acts as a potent metal chelator and decreases inflammation in the brain.

Recommended dose: 50–100 milligrams a day

Ginkgo biloba. This ancient herb can increase blood flow, decrease clumping of blood, decrease free radicals, and increase glucose to reduce bouts of dizziness, depression, and memory loss. In a study published in *The Journal of the American*

Medical Association, the authors concluded that ginkgo biloba was safe and appeared to be capable of stabilizing and improving (for six months to a year) the cognitive performance and social functioning of people with dementia.

Recommended dose: 60 milligrams two to four times a day

Note: Do not use aspirin with ginkgo biloba.

N-acetyl-cysteine (NAC). Glutathione production may be complemented with the oral administration of NAC. This precursor of glutathione has the unique ability to reduce nitric oxide and, in turn, lower free-radical activity, thereby creating a less-hostile environment for delicate brain tissue.

Recommended dose: 1,000 milligrams a day

Vitamin D. This vitamin has strong antioxidant capabilities and is highly fat soluble making it an ideal candidate to act as a bodyguard for the brain. In fact, vitamin D has been shown to be more potent against free radicals than fat-soluble vitamin E. In a Japanese study, 80 percent of the test subjects with Alzheimer's disease were deficient in vitamin D.

Recommended dose: 800 IU a day

Vitamin E. This fat-soluble vitamin is important for balancing free radicals. Because the brain is more than 60 percent fat, which makes it highly susceptible to free-radical assault, fat solubility is a critical antioxidant feature for preserving brain integrity. In a landmark study in the *New England Journal of Medicine*, one test group was given vitamin E, while another was prescribed the drug selegiline; those supplemented with vitamin E excelled in all areas measured, including longevity and cognitive function.

Recommended dose: 400–800 IU a day

3. Enhancing Neural Function

Coenzyme Q₁₀. Although a deficiency of coenzyme Q₁₀ is usually associated with heart disease, there is growing evidence of the adverse effects that an insufficient supply of coenzyme Q₁₀ can have on the brain. Since most of our cellular energy is derived from the mitochondria, the structures in the cells that manufacture and drive this energy are essential for normal brain function. When this energy powerhouse is malfunctioning, it can result in many of the diseases of aging, including diseases of the brain, and this is where coenzyme Q₁₀ comes in. It will help to restore the fuel that allows brain mitochondria to function normally.

Recommended dose: In a recent study of patients with Parkinson's disease, 1,200 milligrams of coenzyme Q₁₀, given daily, significantly improved the quality of life. For healthy people, 30–100 milligrams are recommended.

Targeted Nutraceuticals

If you want to prevent or help support weakened organs and systems within the body, we recommend stepping up your program with targeted nutraceuticals. They very effectively support bone tissue, the brain, cholesterol management, the heart, the immune system, the joints, the libido, the liver, the prostate, and vision.

We have been involved with the production and distribution of nutraceuticals for more than twenty years and strongly encourage all our clients to take a multivitamin and mineral formula each day. Mesua RX physician foundation formula includes antioxidants, bone support, mitochondrial support, and omega EFAs to help decrease inflammation.

As you've learned, most chronic disease develops at the cellular level and inflammation is perhaps the single-most important causative factor. Detoxifying the body and reducing inflammation with optimum nutraceutical balance is key to helping you reach the Mesua RX fount of health and youth from the inside out.

Appendix E

Calorie Value for Ten Minutes of Activity

Activity	125 pounds	175 pounds	250 pounds
PERSONAL NECESSITIES			
Sleeping	10	14	20
Sitting (watching TV)	10	14	18
Sitting (talking)	15	21	30
Dressing or washing	26	37	53
Standing	12	16	24
LOCOMOTION			
Walking downstairs	56	78	111
Walking upstairs	146	202	288
Walking at 2 mph	29	40	58
Walking at 4 mph	52	72	102
Running at 5.5 mph	90	125	178
Running at 7 mph	118	164	232
Running at 12 mph	164	228	326
Cycling at 5.5 mph	42	58	83
Cycling at 13 mph	89	124	178
HOUSEWORK			
Making beds	32	46	65
Washing floors	38	53	75
Washing windows	35	48	69
Dusting	22	31	44
Preparing a meal	32	46	65
Shoveling snow	65	89	130

Activity	125 pounds	175 pounds	250 pounds
HOUSEWORK (cont.)			
Light gardening	30	42	59
Weeding garden	49	68	98
Mowing grass (power)	34	47	67
Mowing grass (manual)	38	52	74
SEDENTARY OCCUPATION			
Sitting	15	21	30
Light office work	25	34	50
Standing, light activity	20	28	40
Typing (electric)	19	27	39
LIGHT WORK			
Assembly line	20	28	40
Auto repair	35	48	69
Carpentry	32	44	64
Bricklaying	28	40	57
Farming chores	32	44	64
House painting	29	40	58
HEAVY WORK			
Pick and shovel work	56	78	110
Chopping wood	60	84	121
Dragging logs	158	220	315
Drilling coal	79	111	159
RECREATION			
Badminton	43	65	94
Baseball	39	54	78
Basketball	58	82	117
Bowling (nonstop)	56	78	111
Canoeing (4 mph)	90	128	182
Dancing (moderate)	35	48	69
Dancing (vigorous)	48	66	94
Football	69	96	137
Golfing	33	48	68

Activity	125 pounds	175 pounds	250 pounds
RECREATION (cont.)			
Horseback riding	56	78	112
Ping-pong	32	45	64
Racquetball	75	104	144
Skiing (Alpine)	80	112	160
Skiing (cross-country)	98	138	194
Skiing (water)	60	88	130
Squash	75	104	144
Swimming (backstroke)	32	45	64
Swimming (crawl)	40	56	80
Tennis	56	80	115
Volleyball	43	65	94

Calorie values are approximate.