

"Alpha lipoic acid is probably the most potent . . . antioxidant known to man"

—*World News Tonight* with Peter Jennings

# The Alpha Lipoic Acid

# Breakthrough

The Superb  
Antioxidant That  
May Slow Aging,  
Repair Liver Damage,  
and Reduce  
the Risk of Cancer,  
Heart Disease,  
and Diabetes

**BURT BERKSON, M.D., Ph.D.**

Foreword by Julian Whitaker, M.D.

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**Burt Berkson, M.D., Ph.D.**



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**I dedicate this book to my teachers: Max Greenberg, who gave me the confidence that I needed to succeed; Milt Berkson, who taught me how to have fun; Albert Greenberg, who sparked my interest in biology; Steve Hunderbolt, who showed me how to fix mechanical things, and that with patience and with knowledge, practically anything could be accomplished; Donald Rogers, who taught me how to be a scientist; and Fred Bartter, who showed me how to practice medicine. These men are among the finest gentlemen to have occupied this planet.**

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# Foreword

**W**hen I was in medical school in the mid-1960s, I was convinced that the medical profession was pure. I was convinced that the profession and all those in it were driven by the natural inclination to alleviate suffering and disease. I was convinced that the mere suggestion of patient benefit from therapies not commonly used, such as acupuncture, coenzyme Q10, alpha lipoic acid, chiropractic, or vitamin C, would be quickly examined in an unbiased fashion and would be incorporated if found to be helpful. I was proud of my chosen profession.

Today, thirty years later, the profession embarrasses me. I now realize that the majority of physicians who make up the profession, particularly those in positions of power and authority, have no intention of investigating therapies other than those from pharmaceutical manufacturers. In fact, as macabre as it may seem, many physicians would rather that their patients die than be saved by an unconventional approach. That fact is obvious.

As a medical resident, Burt Berkson had been instructed only to comfort two patients dying from liver poisoning brought on by poisonous mushrooms. When he intervened and saved their lives with alpha lipoic acid, he was

chastised. The following week, a couple dying from the same liver poisoning was admitted to the hospital. This time, Dr. Berkson was specifically told not to use alpha lipoic acid, even though it had miraculously saved two lives just a week earlier. He used it anyway, saved their lives, and suffered the wrath and vengeance of the medical community. As a medical student, this story would have shocked me. I would not have believed it. Today, I am not even surprised by it.

The story of alpha lipoic acid is remarkable. As documented in this book this naturally occurring substance has incredible power to treat and prevent a variety of diseases. In 1996, when I first wrote about alpha lipoic acid in my newsletter, *Health & Healing*, I was astounded that I had not heard of it until twenty years after Dr. Berkson had used it to treat liver toxicity. I remember talking to patients who were alive and healthy because Dr. Berkson had given them alpha lipoic acid. These patients were still angry that the doctor who had saved their lives had been vilified for using an unfamiliar substance.

This is a remarkable book. You will learn about a healing element and the trials and tribulations endured by one of the first physicians to use it.

Dr. Julian Whitaker



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# Introduction

One sunny Sunday morning in October 1977, when I was a medical resident in a large teaching hospital in Cleveland, Ohio, two severely ill patients were assigned to my care. The wife, a pleasant woman in her fifties, had picked some beautiful white mushrooms on Saturday morning. She and her husband ate them for lunch, and the husband ate many more mushrooms than his wife did. The meal was delicious, and the couple felt fine and went about their normal activities for the rest of the day. That night, both went to bed feeling well. However, at about two on Sunday morning (fourteen hours after eating the mushroom meal), both woke up with abdominal cramping and violent vomiting. Propulsive diarrhea started soon afterward, and the husband also had convulsions and seizures.

Terrified, the wife called their son, a paramedic and ambulance driver, and he took them to the local hospital emergency room. There they were diagnosed with having a viral infection—stomach flu—and the emergency room doctor gave each of them an injection of a medicine that should have settled their stomachs. He sent them home and told them to rest and to drink plenty of water to prevent dehydration. But the diagnosis was wrong. Because of the

delayed effects of the mushroom toxins, the doctor and the patients were not aware that the mushrooms had caused the symptoms.

The couple went home and became even more violently ill. Their son remembered a newspaper article about a twelve-year-old girl who had recently died from eating poisonous mushrooms, and she had exhibited the same symptoms as his parents. He had seen my name in the article and remembered that I had a Ph.D. in the study of fungi. He asked his parents whether they had eaten wild mushrooms, and they told him about their lunch. He picked them up again and brought them to the emergency room at the hospital where I worked. Gathering from what he read in the newspaper, the son had guessed that the couple had eaten the Destroying Angel mushroom (*Amanita verna*). He was right.

I first saw the couple at about eleven on Sunday morning, about twenty-four hours after their mushroom meal. The husband, who had consumed several mushrooms, was much sicker than the wife, who had eaten less than one. He was extremely weak, dehydrated, and still vomiting propulsively, although he was bringing very little up. He was very uncomfortable, with muscle spasms, cramping, and painful diarrhea. His laboratory test results were disturbing. His liver function test, which normally should have been between 0 and 30, was in the thousands. The chief doctor told me three things: that these patients were exclusively mine; that there was nothing that could be done for them except to watch them, give them fluids, and possibly relieve their pain; and that the man would most surely die.

But I was young and optimistic, and I was determined to find an effective way to return these patients to health. Although I had never seen a person in such constant and defenseless pain, I did not accept the idea that nothing could be done for the man. He was so nauseated that he

could not get into a comfortable position for even a few minutes at a time. I refused the chief's diagnosis and searched for a way to help my patient. Fortunately, I remembered reading an article in a medical journal about a European drug successful in the treatment of severe liver damage while I was a mycology (the study of mushrooms and other fungi) professor at Rutgers University several years earlier. Because the primary cause of death among people who've eaten poisonous mushrooms is liver failure, the article held a special interest to me.

I called Dr. Fred Bartter, chief of endocrinology at the National Institutes of Health (NIH), who had been mentioned in that article. I asked whether he knew of any treatment for almost-dead livers. He told me that NIH had an experimental drug in stock that European scientists reported to be a liver growth promoter. I asked him to send it to me, and I was able to pick it up at the airport a few hours later.

The drug was alpha lipoic acid (ALA), a natural substance our bodies manufacture in greater or lesser amounts throughout our lives. I administered ALA to both patients that Sunday night, and within a few hours the man, who had been near death, said he was feeling much better. In three days the woman was almost well, and the man was getting out of bed regularly. He was ready to go home within one week. Remarkably, his liver enzymes had returned to normal, and he had regenerated most of his liver.

Despite the fact that the hospital's chief doctor had told me in no uncertain terms that these patients were going to die, when they recovered he said that they would have come around anyway, even without the ALA therapy. He assured me that although these types of recoveries were rare, they sometimes occurred.

Mushroom season was in full bloom, and the next weekend another couple was admitted to the hospital with the same diagnosis. Their laboratory tests were even worse

than those of the man whom I had treated the previous week. Once again, hospital authorities told me that these people had no chance of living—not with their laboratory results. The patients were assigned to my service, and I was ordered not to use ALA—the pharmacists had never heard of the drug before, and it was not on the hospital formulary list. The chief doctor added that because alpha lipoic acid was not on the hospital's approved drug list and was not recognized by any organization that he was aware of, I could not use it again.

Like the first patients, they also showed signs of deadly liver damage, and their bodies were failing fast. I was instructed not to call the NIH until the hospital pharmacy committee met and approved ALA treatment.

Unfortunately, the pharmacy committee meeting could have taken days or weeks, and these patients didn't have that much time to live. Time was crucial if the patients were to survive. Again, I was ordered by the chief doctor to give the patients only the medical support of electrolytes and intravenous fluids. I was told either to stand back and watch the patients die or face reprimand.

But I was a doctor charged with saving lives, and I couldn't do that. We still had some leftover alpha lipoic acid in the hospital, and I felt compelled to help them. I could not just sit helplessly and watch them die. Despite orders to do nothing of the sort, I started an ALA infusion on each of them. Soon after I administered the alpha lipoic acid, the patients started to recover. After a few days, they started feeling well, and their liver functions returned to almost normal. They went home after ten days without any further medical complications.

I probably would have been fired for insubordination if the NIH had not taken special interest in the miraculous recovery of these four patients. I have treated more than a

hundred additional patients with ALA since that time, generally with the same excellent results.

The amazing recoveries of four people with acute liver toxicity could not be ignored, and the NIH sent a medical team to examine my patients. I was finally able to thank Dr. Bartter in person, and we worked out a collaborative ALA research arrangement. I was eventually awarded the Food and Drug Administration (FDA) investigational drug permit for intravenous ALA therapy.

Not surprisingly, the hospital administration was furious with me and branded me as a doctor who could not follow orders, a person who was not a good team player. Unfortunately, this label has stuck with me over time. But what would you do in the same situation? Would you act to save the patients, not following orders, and suffer the resentment of the authorities? Or would you follow their orders and watch the patients die?

In 1997—twenty years after the couple ate the poisonous *Amanita* mushrooms—Dr. Julian Whitaker invited them to appear on his radio show with me. They are still doing well and show no signs of residual liver damage. I have never regretted my decision to use ALA, as I believe it saved the lives of those in my care.

## ALA Success Stories

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In the last two decades I have encountered my share of both criticism and praise for my approach to treating disease with ALA. As a nonconformist in the allopathic medical community, I have suffered ramifications for not passively following orders and for being an independent thinker. But I have also had the opportunity to treat hundreds of patients, and I have consulted with many other doctors about the healing

properties of ALA. This is an old story that not only is characteristic of medicine but also is a part of every human endeavor that is progressive.

I have found ALA remarkably helpful in treating nearly all of my patients, and for a wide range of complaints, from cardiovascular problems to complications of diabetes mellitus. Some of these patients have seen remarkable improvement. For example, I recently treated Mr. Green, a fifty-year-old man. When he first came to me, Mr. Green was skeletally thin because it was extremely painful for him to eat. He had gone to several doctors who told him that this condition was due to a neurological condition that was secondary to his adult-onset diabetes mellitus, and he had no choice but to live with it. Finally, a neurosurgeon told Mr. Green that he could help him by opening up his abdomen and severing the nerves to his digestive tract. The surgeon warned him that numerous side effects might result from this type of surgery, but it would probably alleviate the pain.

Mr. Green came to me looking for an alternative to this drastic course of action. Whenever I prescribe a treatment, I put myself in my patient's shoes. How would I want to be treated if I asked a doctor to help me? Why would I prescribe a more expensive and complicated treatment or procedure when I can, in the majority of cases, prescribe something simple and inexpensive, such as ALA, and see better results in less time?

So, in addition to his regular diabetes medication, I put Mr. Green on a good, healthy diet with nutritional supplementation, prescribed moderate exercise, and started him on an oral dose of ALA. Within three weeks most of his pain subsided and he rapidly put on weight. In another three weeks, Mr. Green was completely free of pain. As a bonus, his blood sugar fell to close to normal. Also, as a result of the treatment and exercise, Mr. Green's muscle mass and energy

levels increased. Alpha lipoic acid therapy, combined with a healthy lifestyle, made it possible for this patient to avoid a complicated, expensive, and dangerous surgery.

About ten years ago I educated a group of doctors at a medical institution in Minnesota about alpha lipoic acid and offered to provide ALA to them. At that time, they were reluctant to use such an unconventional substance. In 1996, however, I was informed that a department in this medical center had received a huge grant to study ALA as a treatment for the complications brought about by diabetes. I recently spoke to a man who benefited from this research, and his story is told in chapter 7. It is very rewarding for me to see that ALA is being used by other doctors to save and better the lives of others.

## ALA: One of Biochemistry's Most Important Findings

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Alpha lipoic acid—ALA—is an amazing substance and one of biochemistry's most important findings. It has improved the health of many who thought that science and medicine had given up on them, and it is also helpful in maintaining health in healthy people. Ignored by the American scientific and medical communities for so long, today its benefits are finally coming into the light.

ALA has virtually no side effects if given in the correct dosage. Because it has so many beneficial and incontestable influences on cellular function, with the proper protocol it is helpful in treating not only liver disease but also diabetes, HIV-positive patients, AIDS, immunosuppression, psoriasis, eczema, burns, skin cancer, multiple sclerosis, Lou Gehrig's and Parkinson's diseases and other neurological conditions, rheumatoid arthritis, systemic lupus, scleroderma and other

autoimmune diseases, macular degeneration, cataracts and other eye diseases, heart disease, blood circulation, stroke, and hardening of the arteries. It also keeps patients free of many side effects encountered with other treatments. In this book you will learn the details of this remarkable drug.

I hope that my twenty years of medical practice and thirty years of research experience described in this book will be of interest to you and bring you closer to maximal health. Please remember: the information presented in this book is for educational purposes only and not meant as a substitute for professional medical care. If you have health problems, see your doctor.

Burt Berkson, M.D., Ph.D.  
Las Cruces, New Mexico



# How Modern Life Affects Health

## *The ALA Connection*

**A**lpha lipoic acid, in my opinion, is an indispensable ally in our attempt to keep ourselves healthy in a world whose stresses and pollutants work to make us ill. Even though we may eat nutritiously, get a fair amount of exercise, do “all the right things,” the healthful balance is increasingly weighted out of our favor. Let me show you what I mean.

Several years ago, a hospital corporation that needed an administrative doctor to oversee the medical staffs in three Midwestern towns contacted me. I thought the job might be interesting, so the corporation flew me to Chicago, where I rented a car. Driving south through the countryside, I was impressed by the radiant and lush fields of corn and soybeans and the dark black soil. I had spent many happy years here working on my master’s degree and Ph.D., and I contrasted this beautiful green countryside with the dry, gray, and desolate region of the Southwest where I currently lived.

I was met at the hospital headquarters by the CEO of the hospital system, a warm and friendly man. We went back to his office and did a lot of talking. He said that most of the doctors and administrators in this corporation, unlike many other hospital businesses, were very laid-back and got along very well. Because of my relaxed personality, he thought I would fit in well with the corporation. I agreed to take a tour of his hospitals.

We drove to a nearby town and entered a small hospital surrounded by tall oaks and maple trees. It was very clean inside, and the staff was friendly and appeared to be working very hard. I decided to visit some of the patients and ask some questions. The first patient was a middle-aged homemaker who lived on a farm and looked very sick. She told me that she had a very ugly form of colon cancer. In the next room, I spoke to a young man who said that he had just been diagnosed with leukemia, a type of blood cancer. A third patient, a sixty-year-old farmer, informed me that he also had colon cancer and it had spread to his liver. He added that his doctor advised him that he did not have very long to live. Then I went up to the intensive care unit and visited several more patients in various degrees of distress. I expected that the patients would be suffering from different forms of heart disease or strokes, as one would expect to find in most hospital intensive care units, but most of them had some acute problem as a result of cancer treatment. We visited two other hospitals in nearby towns, and I found that the great majority of the seriously ill patients were suffering from some form of cancer, not blood vessel disease.

I was surprised and dismayed by what I was seeing. In the region of the Southwest where I practice, I very rarely see cancer patients. People usually live to a ripe old age and most often die of heart disease or stroke. What was so different about this region? And why were the people where I

lived almost free of cancer? I contemplated these questions on the ride back to the corporate headquarters.

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*Today humans are exposed to more toxic chemicals than at any other time in their evolution on this planet. . . . Alpha lipoic acid is an indispensable ally in our attempt to keep ourselves healthy in a world whose stresses and pollutants work to make us ill.*

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As we drove on the two-lane blacktop road, I saw a farmer pour unused pesticide from a large can into a common ditch along the road. I asked the hospital administrator about this practice, and he said that it was frequently done. Naturally, I thought pouring pesticide into a ditch would poison the water supply, so I asked in concern where the people of this county obtained their drinking water. The CEO answered that the drinking water came principally from small wells and that no one has ever proven that the pesticides entered the water or made people sick. He said that the emergency room director at the first hospital we visited told him that he had never seen a farmer get sick from coming in contact with pesticides. "Let's hope no one ever does," he continued. "It would genuinely hurt our agricultural economy."

As we drove along, I saw a refinery that discharged large amounts of heavy black smoke into the atmosphere. It exited the exhaust pipes and rose into the air for a while and then slowly fell to the ground, forming a smoggy gaseous envelope that was evident for over three miles. Several farms were immersed in this foulness as cattle grazed in the fields and farmers worked around the barns, apparently unruffled by these malodorous and obscene poisons. The adjacent fields, north of the refinery, were barren and the ground appeared to be coated with soft shiny tar. Tears dripped from my irritated eyes, and my nose became stuffy as we drove by this operation. The odors were so strong that it was difficult to catch a good breath. I couldn't help but wonder what these mixtures of poisons were doing to the immune systems of the local people.

My thoughts were interrupted by the hospital administrator, who informed me that the county was fortunate to have the refinery because it provided 220 good jobs. I asked whether the local government had considered checking the pollution control devices at this refinery. He responded that there was no reason to irritate or provoke this company unless the town wanted them to move their business elsewhere.

We turned onto a freeway, drove a while, and then stopped at a large and popular fast-food restaurant for a cup of coffee and some more discussion. The restaurant was crowded with children, of various ages, who were on their way home from school. Many of them were overweight, and they were eating nutrient-poor, very high-calorie foods that many people in this country base their diets on. It may be okay to eat fast food once in a while, but these kids looked like they ate cheeseburgers and French fries every day. Many were also eating a frozen dessert made from a powdered milk product that contains a large amount of refined sugar. In one corner I saw a group of older men and women

eating fried fish sandwiches with mayonnaise. They were drinking coffee to which they all added artificial sweetener and imitation creamer. I heard one woman say that she didn't use sugar in her coffee anymore because her doctor said she might be developing "borderline" diabetes. Because of high cholesterol, her doctor put her on a cholesterol-lowering drug. He also advised her to eat more fish and vegetables, which explained her meal. In her mind, she was following the physician's suggestions. However, this woman, like many other people, was actually fooling herself by eating the fast-food fish sandwich and thinking that she was having a healthy meal. The fish filet was breaded and deep-fried in unhealthy frying oil that had been used for a long time without changing. During that period, in the evening when the oil had cooled, fungi and bacteria grew and deposited their toxic waste products. The high-calorie and potentially toxic cooking oil, the mayonnaise, the margarine, and the fat-soaked breading certainly were not heart-smart. And the artificial sweetener and imitation creamer were unquestionably more unhealthy than a moderate amount of milk and sugar. Her meal was also almost devoid of any natural fiber.

The drive back to the corporate offices from the last hospital answered all of my questions concerning why there were so many cases of cancer in the region. These people were absorbing myriad immunosuppressive toxins through their skin and lungs every hour of every day. And the food they ate lacked the protective nutrients that could help neutralize and destroy those toxins. In fact, their diets actually exacerbated their already dire conditions.

The visit to central Illinois was a sobering and educational experience. After that trip, I became certain that an unwholesome lifestyle was the most important contributor to the development of cancer and heart disease.

## Living in a Toxic Environment

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Our ancestors were not routinely exposed to the types of poisons that we encounter in our daily environment, and consequently we have not evolved the proper physiological machinery to break down these toxins. Some of our ancestors lived near active volcanoes or highly radioactive regions or were exposed to substances that might have damaged their immune systems. However, most of them did not remain in those regions. The few who did usually died from environmental impact.

Today humans are exposed to more toxic chemicals than at any other time in their evolution on this planet. The poisoning of our citizens is not the result of progress and industrialization but originates from the lack of common consideration for other people and individuals' inability to clean up after themselves. Candidly, the heads of large corporations admit that cleaning up properly will lower their profit margins and cause them to raise prices. Some feel that operating a nonpolluting plant does not make any difference since the average citizen really doesn't really care about environmental quality.

Early in this century farmers did not try to kill all of the insects in a region but accepted the fact that the insects would be more numerous in some years than at other times. During the bad years they sprayed pesticides that were toxic to insects but not very deadly to people. During the 1940s DDT and other related petrochemicals were developed as sprays for killing malaria-carrying mosquitoes. This new type of synthesized pesticide was very effective, destroying many of the mosquitoes. However, most helpful insects and other species also were killed. These poisons consequently caused a great number of biological catastrophes including, quite possibly, deleterious changes to our immune and reproductive systems.

The DDT-type pesticides were cheap and could be produced from the plentiful crude oil supplies. Farmers, corporations, and consumers were excited by this development because large populations of insects could be destroyed with a single spraying. In cities people were spraying DDT everywhere. It temporarily destroyed almost entire bedbug and cockroach populations. If the first sprayings did not work, you could spray again and kill even more bugs. Most of the sprayers did not realize that the bugs had tremendous reproductive capacities and the few bugs that survived would produce millions of baby bugs that were not affected by the poisons. As these new resistant bugs appeared, people sprayed even more and, in my opinion, caused immune system illnesses among many of their children. The immune system illness symptoms did not appear for years and were not associated with the poisons by the populace or the people who profited by this revolution.

Today many of us are immersed in a poisonous environment. Because the petrochemical toxins are fat-soluble, they permeate all biological membranes, including human skin and the skins of fruits and vegetables. Toxic chemicals saturate our food, the newspapers that we read, the cars that we drive, and the computer chips that drive our office machinery. Set up a new computer or television set; in many cases you can smell the toxic solvents evaporating off of this equipment for weeks after you opened the box.

Poisons are sprayed everywhere: the vegetables that you eat, the office where you work, the school where you study, and even in your home. I have a neighbor who asked me whether I ever see roaches in my house, and I answered, "Yes, on occasion." "What do you do when you see them?" he asked. "Sometimes I step on them," I replied. I also told him that I don't kill the spiders in my home because they seem to do a good job of controlling most of the unwanted bugs. "Well," he told me proudly, "I haven't seen a bug in

my house since I hired exterminators to spray the entire house and yard." I often see him or his wife with large professional-type spraying equipment spraying along the periphery of their home and on their window screens. Incidentally, this neighbor and his wife are in the process of receiving chemotherapy for metastatic cancers.

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*As children, our livers and every one of our cells produce large quantities of ALA. As we grow older, our bodies must maintain a high ALA level to stay healthy. Ironically, as we age, we manufacture less and less of it.*

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While many insects have evolved complex mechanisms to break down pesticides and petrochemicals, humans are not as fortunate. Most humans must suffer the long-term health consequences of toxic exposure. I am positive that the exposure to various pesticides and to polychlorinated biphenyls (PCBs) affect our reproductive capabilities just as they interfere with animal reproduction. These poisons imitate human reproductive hormones and disturb the reproductive cycles.

Many scientific studies describe how these chemicals can cause immunosuppression and consequently can lead to cancer and other horrible diseases.<sup>1,2,3,4</sup> Of course, the



industry will reject any medically related responsibility for their product. According to nutritional author Jack Challem, whistle-blowers and other concerned people are dismissed by industry as “environmental extremists” and “health-food nuts.”<sup>5</sup> Clearly, if we want to see any changes in our environmental quality, we must become better educated as to the safety and the risks of all industrial products and hold those who poison our environment responsible for their actions.

Why was the region in the Southwest where I lived at that time almost free of cancer? I think it is because of the simple lifestyles of the local residents and the freedom from industrial pollution. Most of my neighbors were ranchers and lived off what their land could produce. They generally went to bed early in the evening and woke up before dawn, allowing for plenty of immune-boosting sleep. They grew most of the food they ate. Every ranch had its own green garden with a plentiful supply of cabbage, broccoli, spinach, and carrots. The ranchers ate a great amount of red meat, but the meat came from free-grazing cattle that traveled great distances each day to feed on the sparse local flora. In contrast, most of the meat we buy in the supermarket comes from animals raised in close, unclean, quarters and regularly pumped full of growth hormones, antibiotics, and other chemicals. The animals are also fed processed commercial diets, and sometimes these foods are manufactured from, among other things, the dead bodies of other animals that died of infections and other diseases.

The ranchers where I lived worked very hard, so they got plenty of exercise. I had patients in their nineties who spent every day on horseback. Most of the working men were lean and muscular. (In contrast, many of the women seemed to become more sedentary with age, and they

tended to be overweight and suffer from more heart disease than their male counterparts.) The residents got their drinking water from wells and natural springs. When I lived in that region, there was very little crop spraying and industrial pollution of the drinking water. Sadly, times have changed in the last several years. The oil companies have moved refining plants into the region, and many commercial animal feed lots have taken over the subsistence-type ranches. I suspect that these commercial operations have polluted the air and water or will do so in the near future. And I doubt that the citizens of that region are as healthy as they once were. I suspect that the doctors are treating many more cases of cancer now.

The industrial poisons that we find in our surroundings put a great deal of oxidative stress on our many delicate biological systems. This can create trillions of additional free radicals—unbalanced molecules that react with stable neighboring molecules and start a cascade of reactions that can ultimately lead to cell damage and death. Just eating a healthy diet with a normal supply of vitamins is not enough, in my opinion, to protect us from these poisons. When the free radical levels are raised beyond the capacity of our normal defensive mechanisms, we need to supplement our diet with antioxidants and other free radical scavengers. Every cell in our body is prey to the attack of free radicals. The free radicals cause DNA damage and destroy cell membranes. Our ability to recognize and prevent free radical damage should help us prevent chronic disease and forestall the aging process.

Balance is important. If we were not subjected to the barrage of poisonous substances each day, we would be able to live a healthy, long life just by eating a good diet, getting the proper amount of exercise, and reducing situational stress. But dangerous industrial chemicals have weighted

one arm of the balance out of our favor. And, I believe, to balance this equation in your direction, you must augment your normal diet with potent antioxidants. One of the most important, in my opinion, is ALA.

## What Is Alpha Lipoic Acid?

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ALA differs from other supplements, such as many vitamins and minerals, in one important way: The human body already manufactures it throughout our lives. As children, our livers and every one of our cells produce large quantities of ALA. As we grow older, our bodies must maintain a high ALA level to stay healthy. Ironically, as we age, we manufacture less and less of it.

### *The Discovery of ALA*

ALA is not a new discovery; it was known to be a fundamental chemical required for the normal growth of bacteria as early as the late 1930s. It was not isolated, however, until 1951, when it was separated from ground-up liver tissue by a biochemist, Lester Reed, Ph.D. Dr. Reed purified only a very minuscule amount of delicate yellow ALA crystals from a sample of liver weighing more than two hundred pounds. He also separated a related substance from liver, beta lipoic acid (BLA). He noted that BLA had much less biological activity than ALA. Because ALA could dissolve in lipids (fats), it was named lipoic acid. Other scientists suggested that it should be named thioctic acid because it contained two sulfur atoms (*theion* in Greek) and eight (*octo* in Greek) carbon atoms. Today, many scientists still refer to ALA as thioctic acid.

### ***ALA Works by Producing Energy and Scavenging Free Radicals***

ALA works on the cellular level to help produce energy. To do this, it acts as a *coenzyme*—a helper of enzymes—in the cell's major energy cycle. As a coenzyme, ALA takes part in a multienzyme process preparing the fuel for the mitochondrion, the powerhouse of the cell.

All foods—carbohydrates, fats, and proteins—are broken down into simple organic chemicals. Once foods are sufficiently processed, they enter the cell and are methodically burned to produce energy. Alpha lipoic acid changes certain chemicals that are required for energy metabolism, and it provides the means by which these essential substances can enter the mitochondrion. Some scientists believe that increasing the intake of ALA can greatly increase the amount of fuel burned in the cell, thereby augmenting the amount of energy available to your body for tasks such as muscle movement, growth, and repair of tissues.

ALA also appears to have the extraordinary ability to prevent damage to the cell at the genetic level. It changes certain chemicals that are required for energy metabolism, and it provides the means by which these essential substances can enter the mitochondrion. Because ALA is operative in so many basic cellular functions (described later in this book), it has a great future as a drug for any number of diseases.

### ***The Future of ALA Treatment***

Can alpha lipoic acid be used to treat cancer, heart disease, and AIDS? Probably the most interesting and conceivably the most significant function of ALA is its role as a modulator of gene expression. Our genes determine who we are

and who we will become. Is it possible to modify these genes and produce a different effect? For example, if a person has a genetic predilection to developing diabetes mellitus, or cancer, or heart disease, can a simple chemical antioxidant molecule—such as ALA—modify gene expression sufficiently to stop the disease process?

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*ALA also appears to have the extraordinary ability to prevent damage to the cell at the genetic level.*

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Over the last several years, a great amount of research has been dedicated to answering these questions. Some fascinating information has emerged from these studies. It appears that oxidative stress—the bombardment of our cells by toxic molecules called free radicals—serves as a signal for the stimulation and regulation of gene expression and, consequently, cell function. As you will learn, ALA is a superior antioxidant and free radical scavenger. Can ALA neutralize the oxidative stress and ultimately predetermine a cell's future? And will ALA interfere with the harmful processes that eventually cause disease?

Will simple antioxidant drugs such as ALA be the future therapeutic agents for heart disease and cancer? This fascinating and important subject will be discussed further in subsequent chapters. We will also look at ALA's function in relation to the normal activities that occur in cells and how ALA may combat dysfunctional cells. And we will explore the conventional therapies for various illnesses and

compare them with other approaches to treating disease using ALA—approaches, in my opinion, that are often far more effective.

## ALA and Everyday Health

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I believe that ALA deficiency is at the root of many common yet serious health problems. If you search the ALA literature, you will find articles that describe how ALA can inhibit the reproduction of the AIDS virus,<sup>6</sup> how ALA may prevent cataracts of the eye,<sup>7</sup> and how ALA protects the kidneys from free radical and antibiotic damage.<sup>8</sup> You will find scientific papers that explain how ALA insulates the pancreas from inflammatory attack and possibly prevents diabetes.<sup>9</sup> You will also find other studies that describe how ALA keeps T-lymphocytes from committing suicide<sup>10</sup> and consequently enhances your immune system function. You will find information showing that ALA increases the amount of helper T-cells in the blood<sup>11</sup> and helps fight many disease processes, including cancer. Other articles report that ALA decreases the toxic side effects of cancer chemotherapy,<sup>12</sup> and some reports suggest that ALA protects the basic blood-forming tissue from ionizing radiation and thus prevents leukemia.<sup>13</sup> You will find many articles that describe how ALA can be used for treating diabetes mellitus<sup>14,15,16,17</sup> and serious liver disease.<sup>18,19</sup> Some researchers describe how ALA protects the heart and brain from the necrosis (cell death) that follows a heart attack or stroke.<sup>20,21,22</sup> Each time I check, many more studies and reports have been published.

My experience has supported these findings. In the more than twenty years that I have been working with ALA, it has given astounding rebounds of health to many patients who have had nowhere else to turn. ALA has stimulated the

regeneration of liver tissue in those who had only the odds of a complicated and risky liver transplant in their favor. ALA has provided people who live with diabetes the opportunity to lower their insulin dosage and be relieved of the pain that this condition often produces. I have actually witnessed prescription-grade injectable ALA give life back to people who would have died without it.

Alpha lipoic acid is more than just another hot supplement you can buy over the counter of your local natural foods store: It is indispensable to the proper working of the human body. It seems logical to me that if we produce smaller quantities of ALA as we get older, it is necessary to supplement our diet with this substance as we age to remain healthy. Various scientific studies illustrate this concept; for example, a good and highly technical and specific text on the subject is *Lipoic Acid in Health and Disease*, edited by Fuchs et al. (New York: Dekker, 1997). We'll look more closely at the interplay among biology, nutrition, and ALA in the next chapter.

# Biology, Nutrition, and Supplements

## *The Role of ALA in Keeping Us Healthy*

**T**om Bradley was a forty-five-year-old industrial chemist who worked for a large paint factory in Chicago. He ate a proper diet, rich in fruit and vegetables, got eight hours of sleep each night, and played an energetic game of racquetball four times a week. When you saw him at the gym, he appeared to be the picture of health. He was tall, lean, and well muscled.

In time, Tom noticed that he bruised more easily and that he was extraordinarily tired when he got home from work. He visited his doctor and was diagnosed with leukemia. He was aggressively treated with conventional cancer therapy and died within eight months.

Tom lived a good lifestyle and ate an excellent diet; however, he worked at a job where he was constantly exposed to extremely toxic chemicals. These poisons suppressed his



body's ability to fight disease. The suppression of his immune system permitted a cell that would, under different circumstances, have been destroyed by his own "killer cells" to proliferate and, ultimately, take his life.

Over many years of research and working with patients, I have come to believe that to remain healthy and age gracefully in the highly polluted environment in which we live, we must supplement our healthy diets with antioxidants such as ALA. Why do I say "supplement a healthy diet" rather than simply "eat a healthy diet"? Because if you are middle-aged—that is, over forty—you can never obtain enough alpha lipoic acid from food alone. You would have to eat about a hundred pounds of spinach to obtain enough ALA to fill a hundred-milligram capsule. Clearly, supplements are the obvious choice. And we must combine and balance these vitamins and antioxidants properly.

I also believe that if you are contemplating using supplements, it is essential to do it with both eyes open—that is, with a basic understanding of how the human body works and how the supplements affect it. This is especially true if you are thinking about supplementing with ALA. Since alpha lipoic acid works at the cellular level, these concepts are an important point of reference.

## A Quick Course in the Workings of the Human Body

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The more you know about how your body functions, the more you can access its needs and maximize its use. In this chapter we'll take a look at how our bodies work and the kinds of nutrients they need to work properly. I highly recommend that you learn even more through further reading and asking your physician specific questions.

### ***The Cell***

The cell is the basic living unit capable of performing all of the fundamental functions of life. Cells of different types make up different tissues, and different organs are composed of these different tissues. A thin cell membrane made from lipids (fats) and proteins surrounds each animal cell and serves as a barrier that regulates what enters and exits and allows each cell to function as a distinct unit. Housed within the confines of each cell membrane are a number of active organelles anchored in a living gelatinous material called the cytoplasm.

*Nucleus* The nucleus is the cell's most conspicuous organelle and its control center. Like the cell, the nucleus is also surrounded by a delicate and dynamic membrane. The membrane, the nuclear envelope, allows the passage of materials from the cytoplasm to the nucleus, and vice versa, through nuclear pores and complex membrane responses. The nuclear envelope, like the membrane that surrounds the cell, is in fact composed of two membranes consisting of fat and protein. The colloidal material surrounded by the nuclear envelope is called the nucleoplasm.

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*The more you know about how your  
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cess its needs and maximize its use.*

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*Chromosomes* Inside the cell nucleus are the long strands of deoxyribonucleic acid (DNA) known as chromosomes.

Chromosomes contain the blueprint for each individual in the form of structures called genes. Genes are the actual pieces of information that direct the function of the cell.

During cell division, the DNA in the nucleus is reproduced and distributed equally to each resulting new cell. Ribonucleic acid (RNA) and DNA store and transmit all of the instructions that control cell function.

Within the nucleus is a dense body termed the nucleolus. The chemical required for the formation of proteins, RNA, is synthesized here.

### *Organelles*

Organelles were difficult to see prior to the introduction of the electron microscope. Each tiny organelle has several indispensable functions.

*Ribosome* One organelle, the ribosome, manufactures new proteins, the building material of the cell.

*Lysosomes* Organelles that break down foods are called lysosomes. They contain powerful digestive enzymes that digest food and worn-out cell parts, converting them into simple and usable molecules.

*Centrioles* Organelles forming tiny tubes are called centrioles. Centrioles give rise to flagella, the whips that move cells from place to place, and cilia, which when oscillating move liquids and mucus along tissue surfaces. The centrioles are also necessary for proper human cell division and are active during the division of the nucleus (mitosis). When nuclear division takes place, the centriole produces the tiny tubular fibers that are necessary for the proper separation of the chromosomes.

*Vacuoles* Some organelles serve as garbage collectors; others secrete substances such as insulin. Cellular waste dump organelles are called vacuoles and move to the cell surface to discharge their waste products into the bloodstream, where they are carried to the kidneys or the digestive organs and eliminated.

*Golgi Apparatus* Another organelle, the Golgi apparatus, is a system of microsacs storing and discharging various cell products such as mucus and insulin.

*Endoplasmic Reticulum* The endoplasmic reticulum is a system of channels, through which the cellular substances flow. It nets its way throughout the entire cytoplasm of the cell and forms a multidimensional web of channels connecting the cell membrane to the nuclear membrane.

*Mitochondrion* Another fundamental organelle is the mitochondrion. It functions as the powerhouse of the cell and, as a result, produces the energy that is required for life.

The mitochondrion is actually a package of enzymes responsible for the slow and orderly burning of food with oxygen (aerobic respiration). The energy produced in the mitochondrion is in the form of high-intensity molecules called adenosine triphosphate (ATP). In cells with high energy requirements, such as heart muscle cells or liver cells, mitochondria are very abundant. One microscopic liver cell may contain more than two thousand mitochondrial powerhouses. The outer mitochondrial membrane is the interface between the mitochondrion and the cytoplasm. The inner mitochondrial membrane is folded inward and forms a series of layers called cristae that extend into the fluid of the mitochondrion. It's along these cristae that much of the cell's energy (ATP) is produced.

Mitochondria are thought to be the descendants of free-living parasitic bacteria. They contain their own DNA and RNA and have their own ribosomes to produce proteins. They are often rod shaped and look and function like free-living bacterial cells. As a matter of fact, most evolutionary biologists consider that mitochondria were once free-living primitive bacteria that, many years ago, attacked and took up residence in the first higher-type eukaryotic (with a nucleus) cells.

These early eukaryotic cells, our ancestor cells, were sluggish in their metabolism and functioned much more efficiently when they were infected with parasitic bacteria growing in their cytoplasm. The parasitic bacteria produced great amounts of ATP. Over the millennia, some of the cells infected with these parasitic and energy-producing bacteria evolved a symbiotic relationship with the bacteria. Consequently, today trillions of these symbiotic bacteria or mitochondria reside in the cytoplasm of our cells and produce the energy that we require to carry out all of our life functions.

### *Is the Human Cell Just a Colony of Symbiotic Bacteria?*

Mitochondria and bacteria have similar anatomies. Both are small and primitive cellular living structures with a complex series of energy-producing and enzyme-containing membranes that are suspended within their bodies. Neither bacteria nor mitochondria contain well-organized nuclei, and each possesses only one simple chromosome. Mitochondria divide in the same way as bacteria, and it is interesting to note that an electron microscope picture of a bacterium is almost identical to one of a mitochondrion. Some biologists even report sex (exchange of genetic material) between bacteria and mitochondria. The concept that the higher-type

cell, such as a human cell, is actually a colony of different bacteria living together in a heterogeneous and symbiotic community is known as the endosymbiotic theory.

Sugar is the mitochondrion's fuel. All the food that we eat can be ultimately changed to sugar and used as mitochondrial fuel. It is within this energy-producing mitochondrion that alpha lipoic acid does one of its most important jobs. To comprehend this function, we must first understand how green plants produce the basic foods, and, second, we should know how foods are slowly and efficiently processed in the mitochondrion.

## We Are What We Eat

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"We are what we eat" has become a common adage, but it is nonetheless true. The types of food we take into our bodies directly affect the energy we have each day, how we feel, and the health of our bodies. Let's take a closer look at the makeup of the foods we eat.

### *Carbohydrates: Fuel for the Body*

Carbohydrates, the most abundant fuel molecules, are called sugars, starches, and cellulose. They are composed of carbon, hydrogen, and oxygen and by weight constitute the major portion of the food in this world.

Carbohydrates are produced by green plants through the process of photosynthesis (putting together with the energy of light). Photosynthesis takes place in plant organelles called chloroplasts. During this remarkable and complex process, green plants take simple carbon dioxide gas from the air, water from the earth, and with the sun's energy

manufacture almost all of the basic food in this world. Without photosynthesis none of us would be here.

*Sugar* Monosaccharides, chains of carbon atoms with oxygen and hydrogen attached in various combinations, are the least complex of the carbohydrates and are also known as simple sugars. Glucose is one example of a monosaccharide or simple sugar. In the cell, glucose is prepared for combustion and energy production. The prepared glucose cannot gain entry into the mitochondrion when there is no alpha lipoic acid available. In other words, without ALA, fuel cannot enter the mitochondrion and no energy can be produced. Without energy there is no life. So, the proper amount of ALA is necessary to keep you alive.

When two monosaccharide molecules bind to one another, they form a disaccharide. Sucrose, everyday table sugar, is an example of a common disaccharide. Chains of many attached disaccharides are called polysaccharides. Starch and cellulose are two examples of polysaccharides.

Simple carbohydrates can be polymerized (attached together in chains) into more complex food storage and structural molecules or broken down by enzymes. So, a green plant producing a monosaccharide by photosynthesis can polymerize these molecules into starches or cellulose.

*Starch* Starch is produced in green plant cells and used for the storage of food. When we eat starch, we produce an enzyme called amylase that digests (breaks down) the starch back into simple sugars. If you allow tasteless starch to remain in your mouth for a while, it begins to taste sweet because of amylase in your saliva. Enzymes, the proteins that cause things to happen in the cell, are often named for the substrate on which they work. For example, the enzyme that breaks down sucrose is called sucrase, and the enzyme that

breaks down the sugar maltose is called maltase. A snail can get food value by eating the cell wall of a mushroom (chitin), or a termite can eat paper (cellulose). With the enzymes chitinase and cellulase, these animals digest these complex carbohydrates (polysaccharides) into glucose to be processed for combustion in their mitochondria. With the help of alpha lipoic acid, the processed glucose can enter the mitochondrial powerhouse and generate livegiving energy.

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*The types of food we take into our bodies directly affect the energy we have each day, how we feel, and the health of our bodies.*

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*Cellulose* Can humans produce sugar from old doors and wooden tables? It is said that during World War II the Germans collected old wooden doors and furniture to break down cellulose into sugar for industrial use and human consumption. In this way, they unlocked the storage energy from the sun (photosynthesis) from wooden products (cellulose) and converted this stored energy back into the energy that we need to carry out our day-to-day activities.

***Fats: Food Storage Molecules That Provide High Amounts of Energy***

Fats (lipids) are another type of common energy storage molecules found in cells, and they may be solid or liquid



(oils) at room temperature. Cells manufacture lipids from sugars that were originally formed by photosynthesis. For instance, if you eat too many sweets, you may put on fat, especially if you don't get enough exercise. A fat consists of three fatty acids, each bonded to one arm of an E-shaped molecule called glycerol. A saturated fat carries all of the hydrogen that it can, and unsaturated fats carry less hydrogen. Because of the extra hydrogen in saturated fats, they carry more potential energy than unsaturated fats.

We break down all fats into glycerol and fatty acids with the enzyme lipase. We further process the fatty acids into two carbon fragments that may enter the mitochondrion and be processed for energy.

### *Vitamins*

Vitamins, by biological definition, are chemicals our bodies cannot synthesize and must obtain from other sources. Vitamins will be discussed in greater detail in subsequent chapters. Most vitamins are coenzymes, or part of a coenzyme.

### *Enzymes and Amino Acids*

Enzymes are complex chemicals produced by our bodies to help chemical reactions happen. Specifically, they are proteins produced by every living cell.

An amino acid molecule contains an amino group (nitrogen and hydrogen) at one end and an acid ( $-\text{COOH}$ ) group at the other end. Amino acids may be connected to one another by peptide bonds; thus, two amino acids connected by a peptide bond is a dipeptide, three amino acids linked in this way is a tripeptide, and many amino acids bonded in this way form a polypeptide. Polypeptides form proteins. Enzymes are often polypeptides made of several thousand amino acids. There are hundreds of types of

amino acids, but only twenty are required to build proteins in humans and are called essential.

### ***Proteins***

Proteins are synthesized from simple amino acids by organelles called ribosomes. Proteins function as structural, carrier, and enzymatic molecules. Healthy collagen is the structural protein that keeps our skin from wrinkling. Albumen is the carrier protein that transports drugs and other substances to the various parts of our body. Lipase is the enzymatic protein that breaks down lipids (fats). Proteins are also a component in many foods.

Proteins are much more complicated than just simple amino acid chains. They form coils that fold back and forth onto themselves, thus forming very complex, intricate, three-dimensional molecules. Enzymes called proteases can break down proteins. The resulting amino acids can be used to construct new proteins or broken down into sugar molecules and burned as fuel. And alpha lipoic acid is important for the passage of these sugar molecules into the mitochondrion.

The particular molecular structure of ALA enables it to be both water-soluble and fat-soluble and gives it the ability to be a superb detoxifying antioxidant. It is a major player in the fundamental high-energy-producing processes of plants, animals, fungi, and bacteria by helping to shunt sugar into the powerhouse organelle, the mitochondrion. It is impossible to get the fuel across the mitochondrial membrane without ALA. ALA must carry it across this membrane and prepare it for fuel burning and thus the production of energy.

Glucose is the basic blood sugar. To become a cellular fuel, it must be broken down into two smaller molecules called pyruvate. Pyruvate cannot be burned for energy until

it is changed into a compound called acetyl coenzyme A. Pyruvate cannot become acetyl coenzyme A without ALA. If more ALA is available, more acetyl coenzyme A is produced, and, consequently, more energy is produced.

## Why We Don't Get Good Nutrition from a Processed Food Diet

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Our recent ancestors ate from a menu rich in fresh foods: vegetables, fruits, and almost raw meats—all foods rich in antioxidants. Today, most of the food that people eat is processed in some way to ensure an attractive, shelf-stable, product. What does this mean for our diets?

### *Is Processed Food Still Food?*

Unless they are certified organic, fruits and vegetables are subjected to numerous insecticides to discourage and kill insects from eating crops. Fungicides are also sprayed over these plant products. Seeds are also treated with potentially harmful chemicals to discourage the growth of molds that can produce waste products that are sometimes more toxic than industrially manufactured poisons. For example, members of the fungal genus *Aspergillus* produce aflatoxins on food products; these naturally grown poisons are highly powerful carcinogenic (cancer-producing) agents. Years ago, margarine was one processed food that had very high amounts of aflatoxins in it. We don't hear very much about margarine contamination today. I often wonder what toxins might still be in this unnatural and processed food.

### *Food Irradiation*

Controversy has arisen recently concerning the irradiation of meats. Over the last few years we have read newspaper ar-

articles about deadly strains of bacteria in hamburger meat actually killing people. While irradiation kills most of the dangerous bowel bacteria growing on meat products, it also promotes cheaper and even sloppier methods of meat processing. Irradiation of meat ignores the most important question: what is the reason that our meat supply is so heavily contaminated by fecal bacteria? The reason is simple: modern industrial processing of meats promotes contamination. Cattle are often jammed into crowded feeding pens where trillions of potential disease-causing microorganisms are allowed to flourish.

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Slaughterhouses kill hundreds of steers per hour under dirty and dangerous conditions. It's nearly impossible for meat not to be contaminated by the bacteria that were once only confined to the animal's bowels. People demand inexpensive meat products, and it is cost-effective to produce these products in efficient and often filthy industrial meat-processing plants. Yes, irradiation kills bacteria, but it leaves their toxins in the meat and produces an enormous amount of additional free radicals and toxic waste. Personally, I'd rather take my chances with cooking the meat properly.

Additional problems will develop with irradiated meat because this process allows mutant strains of bacteria and other microorganisms to develop. Some of these mutated germs may be radiation-resistant and even more dangerous to our food supply. Once this cycle begins, the industrial irradiation industry could possibly persuade the government to raise the levels of radiation exposure to the meat and produce even more free radicals, thus further reducing the quality of the meat.

Even some of our cereals and plant seeds have been irradiated to kill potentially harmful pests and to protect us from effectively growing these seeds at home. For example, if poppy seeds were not irradiated, someone might plant a poppy seed in their backyard and create a potential source of heroin and morphine. By irradiating poppy seeds, the government is protecting us from potentially becoming drug addicts or rich.

## Eat a Healthy, Balanced Diet

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To be healthy, it is basic to eat a healthy and well-balanced diet. This is not a difficult assignment if you follow some simple rules. Eat large amounts of whole grains and various fresh and cooked vegetables with each meal. Keep your meat portions down to four ounces or less, and make sure that you drink enough water (at least eight glasses a day). Finally, keep your processed and canned food ingestion down to a minimum.

## Use Supplements Wisely

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If you eat a healthy and balanced diet, will you get all the vitamins and nutrients you need? Some unenlightened

medical doctors even say that if you ingest large amounts of vitamins, it won't improve your health, but you will have expensive urine. Some critics of nutritional medical therapies will tell you that there is actually no real scientific evidence that supplements work. These critics are obviously not up-to-date with the incredible amount of current research on the subject.

For example, if you have Internet access, you can easily find the National Library of Medicine Web site (Medline). Once there, just type in what you wish to search—alpha lipoic acid, for example—and begin your study. You will be astonished by the abundance of positive medical research being done all around the world on antioxidants.

On the other hand, you can go overboard. Some people take large amounts of supplements, though I don't believe that approach is necessary unless the dosages are taken for a specified length of time to counteract a specific ailment. I know that we are constantly bombarded with toxic insults to our body, but the disproportionate ingestion of too many antioxidants can throw our electrochemical systems out of balance and actually promote disease rather than prevent it.

## Helping Your Immune System Do Its Job

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We are complex living machines composed of many teams of cells. These cells have the ability to heal themselves, if given the proper amount of support. Your immune system is constantly neutralizing the boundless toxins in our environment and fighting alien bacteria, fungi, protozoans, and parasites. In addition, cancer cells are always appearing, and the immune system must be able to recognize and destroy them. A normal immune cell, in addition to destroying

invaders, must remember who the invaders are, so that at a later date, it can kill similar germs.

If you live in a highly polluted city or farm region, your immune system is constantly laboring to remove toxins from your bloodstream and tissues. These pollutants may be city smog, industrial chemicals, herbicides, or pesticides. If you smoke, you are exposing yourself to additional poisons. If you are a heavy alcohol user, the same is true. Intravenous drug users inject billions of bacteria, viruses, and fungal spores into their blood, in addition to any harmful chemicals contained in their drug of choice from processing. The foods you eat contain all types of poisons and industrial chemicals intended to keep the product attractive and shelf-stable.

Nietzsche once said, "If it doesn't kill you, it will make you stronger." Well, this is probably true, but there is a limit to this adage. There comes a time when a person's immune system just can't handle any more insults and becomes completely overwhelmed. This point is related best by "the straw that broke the camel's back" concept. When your toxic threshold is reached, the poisons and microbes start having their way. Just compare the appearance and general health of a fifty-year-old person who has smoked three packs of cigarettes a day for thirty-five years and who drinks immoderately to that of a person of the same age with a healthy lifestyle. Disagreeable stress, smoke, alcohol, toxins, excess foods, lack of enjoyment from life, and insufficient exercise are the straws that break the camel's back.

By the time we reach adulthood, our immune system has a memory of millions of kinds of chemical treatments for the innumerable different possible disease conditions. The drugs in the internal pharmacy of a healthy human are much more numerous and have greater efficacy than any that we might purchase in a drugstore. Just think about it: most of the time when we get sick, rest and water are all we

need for an effective cure. Our immune system does the rest. The use of modern drugs isn't always necessary when, in most cases, you can quite effectively heal yourself.

How do we keep our immune system functioning normally? The answer is a healthy lifestyle. Lifestyle consists of eating a beneficial diet with good nutrition, avoiding toxins, enjoying sufficient exercise, having fun, and reducing situational stress. If you understand psychoneuroimmunology, you know that unhealthy situational stress can result in the production of brain chemicals that start an ugly cascade of events that ultimately can depresses your immune system. In chapter 9 I outline my own plan for a healthy lifestyle. Right now, however, let's take a deeper look at ALA and its connection to our ongoing health.



# Aging

## *How ALA Can Slow It Down*

### What Is Normal Aging?

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- Mary, eighty, is active and vital. Her three children are grown, with kids of their own. Mary enjoys seeing her grandchildren, but she also enjoys swimming every day at her local Y. She glows with health despite her years and regularly signs up for classes at the local adult school. She has some arthritis in her fingers but rarely thinks about it.
- Antonia, sixty-seven, says she's "feeling her age." It's difficult for her to get herself out of the house many days. "My mother died at sixty-six," she says, "and I can feel time running out for me too."
- Jack is a retired long-distance trucker. He spent most of his years on the road drinking coffee to stay awake and eating in fast-food restaurants. At sixty-five, he's beat, overweight, and pining for his lost youth.

- John is ten years old. He is tired all of the time and cannot stay awake long enough to do his homework. He feels like a seventy-five-year-old. Physically he is seventy-five years old because he suffers from progeria, a condition characterized by an extremely rapid aging process.
- Mary is forty-five. She is sitting in her doctor's office with people who are much older than she is but look much younger. There are a number of deep wrinkles around her mouth, her eyes, and on her forehead. She finds it hard to breathe. Mary realizes that thirty years of creating trillions of damaging free radicals by smoking two packs of cigarettes a day is responsible for her poor health.

## How Aging Works

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Can we live forever, or are we programmed to die on schedule? Aging, as with most other conditions, involves a variety of factors. In the early 1900s, Dr. Alexis Carrel grew cells from a chicken heart in a nutrient solution for more than thirty years. As a result of his work, many biologists began to believe that cells were immortal if they continued to receive the essential nutrients necessary for life and if their waste products were properly removed.

But in 1976 Dr. Leonard Hayflick reported in the *New England Journal of Medicine* that cells were programmed to divide only a limited number of times. He wrote that human cells had a cell division limit, which varied from tissue to tissue. For example, skin cells that divide every day can carry out many more cell divisions than brain cells. Dr. Hayflick studied tissue that contained cells reported to be able to di-

vide about fifty times. After that, the cell would commit suicide (apoptosis) and die.

Following Hayflick's work, many biologists did not believe that Dr. Carrel's undying chicken cells were actually immortal and that Carrel's study may have been flawed. They held that the heart cells continued to be viable because new cells were added to the culture each day with the nutrient solution. This solution was extracted from living chicken embryos that may have contained living cells that were inadvertently added to the culture medium.

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Hayflick's study was designed differently. After ten divisions, Hayflick subjected certain human cells to freezing temperatures. He discovered that after they were thawed out, the cells would remember that they could only divide about forty more times. In some way, the cells knew that they had the capability of dividing only about fifty times.

Hayflick then observed that after the fiftieth division, the cells would commit suicide (apoptosis). He therefore concluded that cells were not immortal but programmed to die after a specific number of divisions.

What information or cellular structures are responsible for the programmed number of cell divisions? Most biologists believe genetic determinants set the cell program. In 1990, Dr. Cal Harley published a paper in the journal *Nature* suggesting that the telomere, the protective end cap on the DNA molecules of higher-type chromosomes, was the structure that determined cellular aging. This idea was not new. In fact, it dated back to the Russian cell biology research of the 1970s by Alexey Olovnikov. Olovnikov suggested that telomeres shorten with each cellular division and are eventually used up. Dr. Harley and his associates indicated that Olovnikov's theory was probably true.

### *The Telomere As the Aging Timepiece of the Cell*

Cell biologists know that with each division of the cellular nucleus, a small piece of DNA is removed from the end of each chromosome at the site of the telomere, consequently decreasing the telomere's size. When we are conceived, telomeres are at their largest; and at death from old age they are at their smallest. Many scientists now believe that the shortening of the telomere influences the expression of certain genes. And this genetic expression greatly affects the aging process.

### *Progeria and Accelerated Premature Aging*

Progeria is a condition in which children age extremely fast and have a relatively short life span. With progeria, a ten-year-old child develops the body tissues and outward appearance of a much older person, say, a sixty-five-year-old. A

child with this condition is capable of developing all of the diseases normally associated with old age including blood vessel disease, diabetes mellitus, cancer, and even senile dementia. It now appears that children afflicted with progeria are born with much smaller telomeres than normal infants, and this lack of telomere substance may be the reason for the accelerated aging.

We will learn whether this theory is true by following the life cycles of animals that have been cloned from adult cells. The genes that produced Dolly, the cloned sheep, were obtained from the breast tissue of a fully grown adult ewe. Since the mother sheep was an adult, her cells should, if the telomere theory is true, be lacking in telomere substance and Dolly should age faster than a sheep that was procreated in the normal fashion, the union of an egg and a sperm.

## Fighting the Free Radicals That Cause Aging and Cellular Damage

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A significant cause of aging is cellular free radical damage. The free radical theory, popularized by Dr. Denham Harman, suggests that the products of normal cellular oxidation and other extraneous free radicals cause aging.<sup>1</sup> As we progress in years, an increased amount of free radical garbage accumulates in our bodies. The good thing is that we are not completely powerless when presented with this predicament.

### *Free Radicals Destroy the Integrity of Cells*

The cellular free radical debris that builds up over the years, because of its highly reactive chemical nature, devastates the cellular structures—including the active organelles and our genetic material (DNA and RNA). Consequently, a

fifty-year-old has been subjected to forty more years of free radical damage than a ten-year-old has.

### ***The Products of Oxidation Act Like Time Bombs to Destroy Your Cells***

According to Dr. Jeffery Bland, "We live in a world of apparent contradictions and paradoxes, and these contradictions and paradoxes extend to oxygen."<sup>2</sup> Twenty percent of the air that we breathe is oxygen, and almost 80 percent is nitrogen. Nitrogen gas is relatively inert; oxygen is not. All normal higher-type cells (eukaryotic) use oxygen to metabolize foods. This gas in the correct amount is absolutely essential for cellular function and life. The deliberate and precise extraction of energy from foods using oxygen is called oxidation.

Oxidation of food produces most of the energy we need to live. However, some ordinary products of oxidation—the free radicals—may destroy the body from within over the years. We have regular indispensable chemical substances called free radical scavengers that scavenge the free radicals and render them harmless. As we age, however, free radical damage becomes cumulative and a greater job than the free radical scavengers can naturally handle. Eventually, the free radical damage overpowers the organs and shuts them down, a process that results in death.

### ***Free Radicals Can Be Highly Dangerous***

Free radical molecules have uneven numbers of electrons, which makes them highly unstable. The free radical always attempts to stabilize its own molecular structure by grabbing an electron from a stable molecule, which has pairs of balanced electrons. So any stable molecule that comes in contact with a free radical is in danger of losing an electron to

this unstable electron thief. This process results in a chain reaction that may destroy the delicate structure of the cell.

## A Simple and Natural Way to Discourage the Disease Conditions Associated with the Aging Process

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It is probably true that the length of our lifetime is connected to the amount of telomere substance we inherit from our parents. The startling truth is that most of us inherit enough telomere genetic material to live about 120 years. Why, then, do so few of us ever get close to that age? The answer is that the “wear and tear” our organs must endure in the form of toxins in our environment produces free radical damage that seriously undercuts our genetic programming.

Fortunately, we can take steps to repair this destructive process and return our rate of aging closer to normal. Recent biotechnology and molecular biology discoveries indicate that in the near future we will be able add years to our lives with gene therapy. But that’s in the future. What can we do now? We can delay the ravages of environmental toxicity by using these simple and natural approaches as first-line preventative therapy. We can live much longer and healthier lives and effectively delay the negative side effects of aging by following the five rules of healthy living:

1. Eat a healthy, largely vegetable, diet, enhanced with nutritional supplementation, and do not overeat.
2. Become involved in a regular exercise program.
3. Get enough sleep.
4. Limit your exposure to environmental toxins such as alcohol, cigarette smoke, smog, industrial chemicals, radiation, and so on.

5. Try to relieve the destructive situational stress of modern life.

If we follow these rules, we can avoid the dilemma of being “professional patients” and becoming dependent on the complicated and expensive treatments of conventional medicine. (If you have lived an unhealthy lifestyle for many years, of course, the simple and natural approaches may not be very efficacious, and the conventional approaches may be the most effective first-line therapies for you.)

### *Rule 1. Eat Well*

Kevin is a thirty-six-year-old doctor who spends an extraordinary amount of time in hospitals. His eating habits are atrocious. For breakfast, he drinks three cups of coffee and has no food. For lunch, he often buys something out of a vending machine and drinks a few more cups of black coffee. He usually catches a late dinner at a fast-food restaurant. Kevin should know better, but feeling healthy at thirty-six years old, he does not actually realize that he is heading down the road to chronic disease.

Ellen is twenty-nine years old and an elementary school teacher. She thinks she eats a well-balanced diet. For breakfast, she has a sweetened cereal with 2 percent milk. For lunch, she eats at the school cafeteria. Today she had two boiled hot dogs, French fries with catsup, and a small lettuce salad. She did not eat the hot dog buns because she wants to avoid consuming too many calories.

For dinner, Ellen and her husband Bill went to an Italian restaurant. She ordered a bowl of pasta with a cream sauce and clams. She had a small side salad with blue cheese dressing and skipped the bread served with dinner. Ellen believes that she gets all the nutrients she needs from her diet.



The American Heart Association (AHA) recommends a reasonable daily diet that consists of six servings of foods that contain complex carbohydrates. The carbohydrates may include starchy vegetables such as boiled potatoes, unprocessed oatmeal, and whole-wheat breads. Then it is very important to include at least six servings of fresh fruits and green vegetables. To that is added two servings of dairy products. I recommend using only one serving of whole milk on your oatmeal each morning, if you are not sensitive to milk. The AHA suggests eating up to six ounces of lean meat, fish, or poultry each day. I divide the meat meal into three ounces with lunch and three or four ounces with the evening meal. The AHA also recommends using small servings of polyunsaturated fats with meals. I do not use margarine, but I do believe small amounts of butter can be delicious and healthful. I also add olive oil and flaxseed oil to my diet because they have so many healthful benefits (the first may help lower cholesterol, and the second contains omega-3 fatty acids).

I do not agree with the AHA recommendation that mature adults can obtain the optimum amounts of nutrients from just eating a healthy American diet. I think that certain vitamins and antioxidant supplements must be added to our diets to keep us free from the development of disease. I supplement my diet with an excellent multivitamin, vitamin C, vitamin E, B complex, coenzyme Q10, magnesium, and alpha lipoic acid. In the following chapters, I will discuss this subject in detail. My own supplement program is described in chapter 9.

### ***Rule 2. Get Plenty of Exercise***

Our bodies are meant to keep moving. Without exercise, mature adults experience the atrophy of their muscles and

bones. As the muscles become weaker and the bones lose their calcium with advancing age, simple falls may result in serious life-threatening bone fractures. A combination of aerobic and weight-bearing exercise can strengthen the muscles and bones, preserve joint mobility and prevent arthritis, improve normal gait, and give you a general feeling of well-being. Exercise also promotes a good appetite, diminishes insomnia, and helps the digestive and elimination processes. In chapter 9 I will discuss my exercise regimen in detail.

### ***Rule 3. Get Enough Sleep***

“There aren’t enough hours in a day to get everything done” is an often-heard lament of modern life. But what most people don’t know is that sacrificing sleep to get more work accomplished is detrimental to our health in every way.

### ***Rule 4. Limit Your Exposure to Environmental Toxins***

Car and bus fumes, pesticides on foods, secondhand smoke, too much alcohol, industrial wastes and smoke, evaporating solvent from electrical equipment, household and office cleaning solutions, fumes from new carpeting, paint and building materials, radon, asbestos, and careless use of atomic isotopes are just some of the environmental insults that we are exposed to each day in modern society. We can deliberately limit our exposure to these agents that can damage our immune systems with potentially deadly results.

### ***Rule 5. Relieve Stress***

Modern life, as we all know, is filled with stress. External stressors include commuting to work, sitting all day under

artificial light, working too many hours to “get the job done,” picking up after kids, getting dinner on the table every night . . . the list, as we all know, is endless. Add to these some internal stressors—worrying about crime and personal safety, fretting about our children’s health, feeling lonely and in need of companionship, wondering whether your company is going to downsize you out of a job—and it’s a wonder we can even get out of bed in the morning. But that’s not the worst of it: these emotional stressors cause chemical reactions in your brain that may lead to the release of potentially toxic materials that ultimately result in disease.

## How ALA Supplements Can Help Slow Aging

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It’s unlikely we will see any reduction in the industrial alteration of food in the near future. In fact, I think we will see a lot more of it. How can we protect ourselves from the potentially toxic chemicals used in processing? What about the toxic chemicals we produce in our own bodies via the waste products of our own metabolic cycles? And how do we protect ourselves from free radicals generated in our bodies as a result of coming in contact with inhaled city smog, everyday chemicals, prescription drugs, situational stress, cigarette smoke, and numerous other sources?

Antioxidant supplements can help protect us from the damage of free radical bombardment since our bodies don’t have the natural antioxidant ability to stand up to, and to deal with, such a violent storm of assaults.

Alpha lipoic acid is different from other antioxidants or nutritional supplements. It is not actually a vitamin

because we produce it in small amounts throughout our lives. As we age, our cells synthesize less and less of it. When we are young, sufficient levels of ALA are available and allow us to perform at greater functional levels, but by the time we are sixty years old the amount of alpha lipoic acid is so low that we often feel tired most of the time. Just compare the life of a two-year-old child, who eats a healthy diet and produces sufficient amounts of antioxidants playing around the house, with that of a typical sixty-year-old man, sitting on the couch in the living room of the same house. There is a tremendous difference in the energy levels of these two people. The fact is that the sixty-year-old does not have the same energy production that the child has because he does not produce enough of the metabolic keys to the high-energy-producing processes. One of the most important keys to the production of energy is alpha lipoic acid.

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*We can delay the ravages of environmental toxicity by using these simple and natural approaches as first-line preventative therapy.*

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Balance is an important word. If we were not subjected to a barrage of poisonous substances each day—from car exhaust, to pesticides on food, to unknown pollutants in our water—we would be able to live a healthy, long life just by

eating a good diet, getting the proper amount of exercise, and reducing situational stress. But dangerous industrial chemicals have weighted one arm of the balance out of our favor. I believe that to balance this equation in our direction, we must augment our normal diet with potent antioxidants, which we will explore in more detail in the next chapter.

# Fighting the Free Radicals That Cause Aging and Cellular Damage

*ALA As Antioxidant and Chelating Agent*

**T**hink of what our bodies are subjected to in thirty, forty, fifty, or more years of living: inhaled city smog, everyday house-cleaning chemicals, gasoline, prescription drugs, situational stress, X rays, cigarette smoke, years of drinking, polluted drinking water, pesticide-covered foods, meat raised on antibiotics. . . . All of these ordinary, virtually unavoidable environmental stressors can cause free radicals to form in our bodies. And, as we have seen, the free radical theory suggests that the products of normal cellular oxidation and other extraneous free radicals cause aging.

As we get older, an increased amount of free radical garbage accumulates in our bodies. Because of its highly reactive chemical nature, this debris devastates the body's cellular structures, including the active organelles and our genetic material—DNA and RNA. A fifty-year-old, who has

been subjected to years of free radical damage, can face some significant issues as a result.

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*. . . many scientists consider alpha lipoic acid the "ideal antioxidant" because, among other things, it is easily and rapidly absorbed high up in the digestive tract and is therefore available to neutralize free radicals quickly.*

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How, then, does the body normally protect itself from free radical damage?<sup>1</sup> In her book on antioxidants, Carolyn Reuben tells us that we respond by producing substances to surround, control, and destroy the potentially dangerous oxidative products. These essential substances—called antioxidants—may function as free radical scavengers. To illustrate this, Reuben asks us to imagine a preschool with thirty children and only one teacher. She tells us that the teacher may be very good, but she cannot ever keep up with the thirty untamed children; she needs a staff of other capable adults to help her. This is just one metaphor for what is happening to us. The body must also deal with an almost overwhelming number of free radicals that it comes in contact with each day. Eventually, we lose the struggle, age, and get

sick. However, we can effectively slow down the course of aging with antioxidants.

Over the years, free radical damage becomes cumulative and causes aging. Naturally occurring antioxidants block the damage caused by the donation of electrons that are necessary to stabilize the harmful effects of the free radicals. In a healthy body, most free radical damage is normally repaired. However, a small amount of damage always occurs. Eventually, the cumulative damage caused by the free radicals overthrows our body's natural defenses. As these injuries to the cellular components continue to accumulate over the years, they cause aging and chronic diseases such as heart and blood vessel disease, cancer, diabetes mellitus, and eye disease. Additional antioxidants cannot correct all of the injuries caused by free radicals, but they can help prevent the damage from getting out of control and consequently, in my opinion, prolong periods of wellness and slow down the aging process. As we will see in this chapter, many scientists consider alpha lipoic acid the "ideal antioxidant" because, among other things, it is easily and rapidly absorbed high up in the digestive tract and is therefore available to neutralize free radicals quickly.

## Many Vitamins Are Antioxidants

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What are the important antioxidants that may slow the aging process? Many of them are vitamins. To a biologist, a vitamin is a substance necessary for life that the body cannot synthesize. The number of existing vitamins is subject to debate, but many sources agree that there are thirteen. A basic understanding of vitamins and how they work will help you understand the complex metabolic processes that occur in every one of your cells.



***Fat-Soluble Vitamins***

The four known fat-soluble vitamins are A, D, E, and K. These vital substances are stored in our body's fatty tissue, so you don't have to consume them every day to reap their benefits.

***Vitamin A*** Vitamin A is an effective antioxidant. Carrots, sweet potatoes, broccoli, and squash contain high amounts of beta-carotene, and the highest-available food sources of vitamin A are chicken livers, fish livers, beef livers, and certain cheeses.

Some say that vitamin A is not a genuine vitamin because it can be synthesized in the liver when two water-soluble beta-carotene molecules are joined together to form one fat-soluble vitamin A molecule.

At one time, vitamin A was known as the anti-infective vitamin because it is necessary for immune competency. According to Dr. Kenneth Bock, beta-carotene and other carotenoids may increase immune function by enhancing lymphocyte production, increasing macrophage (cells that eat foreign matter and microorganisms) and T-cell activity, and maintaining the membrane receptors that are essential for proper immune function.<sup>2</sup> We also know that vitamin A is important for good vision, robust skin, and healthy mucous membranes. Retin-A, a prescription drug, which is a synthetic vitamin A-like substance, can effectively treat skin conditions such as acne and early wrinkles. Studies demonstrate that vitamin A effectively heals gastric ulcers and prevents stress ulcers. Vitamin A can be toxic in high doses and should never be taken by women contemplating pregnancy.

***Vitamin D*** Vitamin D is sometimes called the sunshine vitamin because it's manufactured in the skin from a choles-

terol metabolite when skin is exposed to sunlight. This vitamin stimulates absorption of calcium. A vitamin D deficiency is likely to result in poor teeth and osteoporosis. Vitamin D is also important for the transport of minerals through the cell, and some recent research has indicated that it may also play a role in the prevention and treatment of colon cancer.

Vitamin D can be obtained from eating cold-water fish and dairy products. The best way of getting vitamin D, however, is through sensible and moderate exposure to the sun. I didn't say sunburn; I said sensible exposure to sunlight. In this way we can manufacture our own vitamin D just as our primitive ancestors did. So, if we make vitamin D in our own skin, is this substance a true vitamin?

*Vitamin E* Vitamin E is an antioxidant that prevents free radical damage to living membranes. It protects the fatty substances in the cell membrane from lipid peroxidation (free radical fatty tissue damage). Vitamin E also prevents oxidation damage to vitamin A. It's believed that this vitamin may also stop cholesterol-like substances from damaging the blood vessel walls, therefore preventing major forms of blood vessel ailments such as heart disease and strokes. Studies confirm that a vitamin E deficiency may result in a reduction in immune function and that vitamin E supplementation can increase the strength of the immune system.<sup>3</sup>

Many patients with AIDS have known of the beneficial effects of vitamin E supplementation for many years. An overabundance of free radicals stimulates the HIV virus to reproduce. Vitamin E is known to quench these free radicals and indirectly prevent the replication of the HIV virus. AIDS patients taking vitamin E, along with other nutritional approaches, report feeling much stronger and healthier. Vitamin E is plentiful in most grains that contain a great

amount of natural oil. We can also find vitamin E in many dark green vegetables, chicken eggs, and various nuts.

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*ALA is an ideal antioxidant that works double duty. It prevents free radical damage in every setting regardless of whether it is in the brain fluids, the blood, stored fat, the heart, the pancreas, the kidneys, bone, cartilage, the liver, and for that matter every cell in every organ.*

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*Vitamin K* Vitamin K assists in the production of fibrin, a necessary factor for the clotting of blood. Colon bacteria synthesize vitamin K. Eating green plants such as spinach and keeping a healthy bacterial community in your digestive tract by eating live yogurt and acidophilus fulfill the vitamin K requirement.

### *Water-Soluble Vitamins*

Water-soluble vitamins are readily eliminated from the body. Because of this, they must be taken regularly. The primary water-soluble vitamins are B-complex and C.

***Vitamin B1 (Thiamin)*** Thiamin acts as a coenzyme in the major energy-producing cycle in the mitochondrion of the cell. The Krebs cycle, as it's called, is a complex series of reactions that produce and transfer energy to ATP (energy storage batteries). The Krebs cycle cannot operate without thiamin, and a person becomes tired and will die without adequate supplies.

Thiamin is also necessary for the brain and nervous systems to function. Very low thiamin levels were found in nearly 60 percent of a group of elderly and forgetful people in Florida.<sup>4</sup> Thiamin functions in the brain in a similar manner as acetylcholine, a neurotransmitter necessary for memory and prevention of senile dementia and Alzheimer's disease. Some doctors believe that Alzheimer's disease may be at least partially due to poor nutrition, especially because of the chronically decreased ingestion and absorption of the B vitamins.<sup>5</sup>

We obtain thiamin from eating unprocessed rice and other whole grains, beans, and green vegetables. Unfortunately, the processed white rice and flour that most people eat is mostly devoid of thiamin.

***Vitamin B2 (Riboflavin)*** Riboflavin is involved in converting other important vitamins and antioxidants into more active forms. Riboflavin is a cofactor in the regeneration of glutathione in the eye and also a catalyst in several reactions involving the body's processing of carbohydrates, fats, and proteins. This vitamin may be obtained in dark green vegetables and whole grains.

People with a mild deficiency of vitamin B2 often have dry and cracking skin, particularly around their nose and mouth. Those with more severe deficiencies of this essential substance may be at risk of immunosuppression and, consequently, prostate and esophageal cancers.<sup>6,7</sup>

*Vitamin B3 (Niacin)* Niacin is a catalyst involved in energy production. It is reported to reduce the blood levels of LDL (bad) cholesterol<sup>8</sup> and total cholesterol. It is also reported to raise the levels of HDL (good) cholesterol. Whole grains and legumes (beans) are good sources of this vitamin.

*Vitamin B5 (Pantothenic Acid)* Pantothenic acid is indispensable because of its role in the production of energy from sugars and fats. It is found in whole grains, green vegetables, and fungal products such as brewer's yeast. Vitamin B5 is also produced by the colon's normal bacterial flora. It is obtained in large amounts from eggs, liver, and avocado. Vitamin B5 assists in antibody formation and the healing of wounds. One report notes that pantothenic acid can relieve the symptoms of allergic rhinitis.<sup>9</sup> I use pantothenic acid every day in my practice for the treatment of acne and osteo- and rheumatoid arthritis, and I find it to be the best single treatment for the prevention and therapy of shingles, genital herpes, and cold sores (herpes virus diseases).

*Vitamin B6 (Pyridoxine)* Vitamin B6 is essential for the metabolism of amino acids and consequently proteins. It is also an antidote for some deadly poisons. I first started using this vitamin as an intravenous treatment for certain types of deadly mushroom poisoning. We obtain pyridoxine from dark green vegetables, whole grains, legumes, and certain fruits such as bananas. I use vitamin B6 in my practice daily to manipulate homocysteine blood levels. Homocysteine is an amino acid that is intimately linked to damage to the coronary arteries and resultant myocardial infarctions (heart attacks). Vitamin B6 is also necessary for a highly effective immune system.<sup>10</sup>

*Vitamin B12 (Cobalamine)* Vitamin B12 is necessary for the proper functioning of the nervous system and digestive

tract. It is also required for red blood cell metabolism and the synthesis of proteins. Our body stores vitamin B12 for years to ensure that we have enough of it. Large doses of vitamin B12 and magnesium supplementation have been reported to be helpful for asthma. B12, along with folic acid and pyridoxine, reduces elevated levels of homocysteine. As mentioned before, the amino acid homocysteine can damage the inner surfaces of blood vessels and lead to blood vessel disease.

Vegetarians are often deficient in this vitamin because it can only be reliably found in meat and animal products. Deficiencies in B12 among nonvegetarians are generally the result of poor absorption by the digestive tract rather than the result of diet. Certain factors are necessary for the absorption of vitamin B12 in humans. First, there must be adequate amounts of hydrochloric acid in the stomach for the release of this vitamin. Then, it must be chemically bound to an intrinsic factor, which is produced by cells in the stomach. This intrinsic factor/vitamin B12 complex is absorbed, with the help of the pancreatic enzymes, into the small intestines. A deficiency of intrinsic factor may result in pernicious anemia. Serious alcoholics are often afflicted with B12 deficiencies because of the damaging effects of this toxin on the lining of the stomach and to the pancreas.

*Folic Acid* Another B vitamin, folic acid, is necessary for the synthesis of hemoglobin (blood pigment that carries oxygen), and other essential proteins. It is partially destroyed when foods are cooked or are stored for long periods of time. It is abundantly found in green vegetables, brown rice, carrots, legumes, and some fungi such as yeasts. This vitamin, along with B12, reduces homocysteine levels in the blood. Many women with abnormal Pap smears actually have a folic acid deficiency, and this condition often resolves after supplementation.

*Biotin* Biotin is another B vitamin. Deficiency of biotin results in skin conditions that appear to be seborrheic dermatitis. Deficiencies are not common because the normal bacterial flora of the digestive tract produce biotin in sufficient amounts. However, people who are treated with long-term doses of certain antibiotics may develop a deficiency of biotin because the bacteria that synthesize biotin are killed off. Biotin is another one of the coenzymes that functions in the synthesis and utilization of foods. This vitamin is active in the utilization of glucose by the liver. One recent report states that daily supplementation of biotin significantly lowered the fasting blood sugars of non-insulin-dependent diabetes patients.<sup>11</sup>

*Vitamin C* Vitamin C is probably the best known of the water-soluble vitamins. It is a very important antioxidant, but it has many other jobs in the body. Many mammals synthesize their own vitamin C. Humans, however, must get it from our food or supplementation because, through evolution, we have lost the ability to synthesize it by losing one of the four enzymes that is necessary to produce it. Vitamin C is found in fresh fruits and vegetables. Cooking, however, destroys much of this vital substance.

A deficiency of vitamin C results in scurvy. People with this condition fail to produce adequate amounts of intercellular cementing substances and produce abnormal collagen, which results in the leakage of vital chemicals from the organs. Dr. Linus Pauling published an article in 1968 on the beneficial uses of vitamin C that started a great debate in the medical communities. The discussion about the use of vitamins as treatments for serious diseases continues to this day.<sup>12</sup>

Vitamin C is also necessary for the synthesis of collagen. Collagen is the protein that holds tissues of the body

together. Deficiencies in healthy collagen result in wrinkles and poor support of vital organs. People with poor collagen look old. Unhealthy collagen also results in permeable tissues that may result in a breakdown of the physical barriers that keep microorganisms in their normal places in the body.

In addition, white blood cells that eat harmful microorganisms require large amounts of vitamin C to do their job. Vitamin C is indispensable for the maintenance of normal levels of glutathione and the regeneration of used-up vitamin E. As mentioned before, glutathione is among the most important intracellular antioxidants and is required as an indispensable immune enhancer and detoxifier (it is described in more detail later in this chapter). Vitamin C also prevents the formation of carcinogens from toxic substances in our diet. Because of its beneficial applicability, nutritionally minded doctors use vitamin C as a preventative agent and treatment for certain forms of cancer.

The U.S. government Recommended Daily Allowance (RDA) for vitamin C is less than 100 milligrams. I believe that this dosage is much too low since adults require at least 1,000 milligrams of this vital substance each day to stave off infection and much more to fight active infections. I take 1,000 milligrams of vitamin C twice a day with meals when I am feeling healthy. I increase the dosage to at least 5,000 milligrams per day when I feel an infection starting.

## Why ALA Is a Potent Antioxidant

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Several factors make ALA the ultimate antioxidant. One very basic reason is that ALA is both a hydrophilic and lipophilic molecule. Because it is hydrophilic, it is soluble in blood and other watery body fluids. Because it is lipophilic, it is also soluble in fats. In contrast, vitamin C is only



hydrophilic and vitamin E is only lipophilic. These qualities make ALA an ideal antioxidant that works double duty. It prevents free radical damage in every setting regardless of whether it is in the brain fluids, the blood, stored fat, the heart, the pancreas, the kidneys, bone, cartilage, the liver, and for that matter every cell in every organ. ALA can perform the same functions in the watery fluids of the cell and in the blood and other aqueous fluids that come in contact with the body's tissues, just like vitamin C. Because of these remarkable characteristics, ALA can also easily pass through the blood-brain barrier and increase brain energy availability.<sup>13</sup>

Another very important property of ALA is its ability to salvage and recycle other antioxidants such as vitamin C, vitamin E, and glutathione. When any of these antioxidants do their jobs and are used up, ALA can make them serviceable again. Because of these characteristics, ALA is very active in every cell and in the spaces between every cell. By virtue of these benefits, ALA may be effectively used to prevent and treat many of the medical conditions associated with the oxidative stress that occurs when the body is overwhelmed by toxic chemicals. This list includes diabetes, toxic states, hyperlipidemia, heart disease, stroke, cataracts, organ damage, cancer, neurological disease, and radiation damage.

ALA does still more. It protects collagen in the skin from cross-linking, thus preventing wrinkling and ultimately the appearance of an aging of the body. It protects the cells' lysosomes from damage, preventing the leakage of powerful enzymes that can digest and kill cells from within. In addition, ALA guards DNA and RNA from the damaging processes that result from certain deleterious and complex cell-signaling chain reactions. In this way ALA can neutralize the potentially dangerous chemicals that trigger the ex-

pression of certain genes that cause cancer. This process is responsible for ALA's profound effect on the beneficial modification and functioning of genetic material. This concept will be discussed in detail in following chapters.

## Reduced Lipoic Acid: DHLA

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After ALA does its work, it is transformed into dihydrolipoic acid (DHLA). The DHLA molecule is the reduced (has had electrons added) form of ALA, and it, too, is beneficial and active. When DHLA is oxidized (has had electrons removed) alpha lipoic acid is produced. So when you supplement your diet with ALA, you are also supplementing with DHLA. The molecule goes back and forth automatically in the body accomplishing its many beneficial functions.

It is, in fact, DHLA that regenerates vitamin C and indirectly recycles vitamin E. Biochemists call this process antioxidant recycling. DHLA does its job and is transformed back into alpha lipoic acid, and then ALA can do its job again. Some of the free radicals that DHLA and ALA extinguish are superoxide radical, hydroxyl radical, hypochlorous acid, peroxy radical, and single oxygen. In the following chapters we will examine these free radicals in more detail. From this point, I will refer to the alpha lipoic acid/DHLA couple as simply ALA.

## Glutathione: The Essential Intracellular Antioxidant

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The indispensable antioxidant glutathione is synthesized within the mitochondrion. Glutathione is a compound composed of the three amino acids: cysteine, glutamic acid, and

glycine. Glutathione may not reliably be augmented by oral supplementation because it cannot always pass over the mitochondrial membrane. Therefore, glutathione must be synthesized within the mitochondrion.

Glutathione effectively protects the body from free radical damage and is a very powerful antioxidant that prevents against the formation of free radicals. It defends the body against the free radical waste products of cellular metabolism and the toxins produced by alcohol consumption, cigarette smoking, cancer chemotherapy, and exposure to damaging forms of radiation. Because glutathione protects our cells against free radical damage, it consequently protects the tissues, organ systems, blood vessels, nervous system, immune system, liver, lungs, and kidneys against disease.

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*ALA salvages and recycles other antioxidants such as vitamin C, vitamin E, and glutathione.*

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Glutathione is a component of certain enzyme systems that protect us from disease. Not surprisingly, many patients who have certain disease conditions have low levels of glutathione. Richard Huemer and Jack Challem write in their book about defending ourselves against supergerms that several glutathione-containing compounds are involved in immunity, detoxification of hazardous compounds, and quenching of free radicals. Enzymes such as glutathione peroxidase and glutathione transferase require adequate

amounts of glutathione and protect the body against several potentially deadly toxins.

### *Alpha Lipoic Acid and Glutathione*

Since glutathione does not usually perform well when taken orally, what can be done to increase endogenous glutathione levels? Several scientists have demonstrated that ALA and its metabolite DHLA provoke the cell to produce significantly higher levels of glutathione. Recently, many HIV patients have been taking supplements that increase cellular glutathione. HIV patients have very high levels of free radicals in their cells and bloodstream, and consequently they are subject to enormous amounts of oxidative stress. Oxidative stress stimulates the replication of the HIV virus. Glutathione prevents the multiplication of the AIDS virus because it quenches free radicals.

## Lipoic Acid Can Protect Against Radiation Poisoning

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Nuclear radiation is an industrial-strength promoter of excessive free radicals that most certainly can kill you. Toxicologists have used antioxidants to treat people who have been subject to all types of irradiation for many years. ALA, specifically, is shown to protect the bone marrow of mice from radiation injury.<sup>14</sup>

One of the most harmful and far-reaching nuclear accidents that we know of took place in Chernobyl, Russia, in 1986. The accident exposed the local population to constant low- and high-level injurious radiation, and the soil in this and regions extending more than a thousand miles

were contaminated with radioactive material. Russian scientists were desperate to help the people, and an ALA study done in the community examined the effects of twenty-eight days of alpha lipoic acid therapy on children exposed to radiation. Researchers reported that ALA, when used by itself and with vitamin E, was an effective treatment for radiation poisoning. In addition, they noted that abnormal liver and kidney functions were corrected with the ALA treatment regimen.<sup>15</sup>

### Alpha Lipoic Acid Is an Excellent Chelating Agent

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Another essential function of ALA is as a chelation agent of heavy metals. The word *chelation* is derived from the Greek work *chela*, which means “crab claw” or “grasping organ.” Certain natural substances, chelating agents, have the ability to grasp and bind metallic substances, neutralize them, and carry them to a place where they can be easily excreted from the body.

Chelation of heavy metals is a natural process that occurs in both animals and plants. Dr. Elmer Cranton writes in his book on alternatives to bypass surgery that chelation allows all living organisms to assimilate and make use of essential metals.<sup>16</sup> This process weds metals with natural body chemicals into a compatible working partnership. He adds that hemoglobin, the oxygen-carrying pigment of red blood cells, is a chelate of iron, and the chelation process is involved in the formation and function of many enzymes essential to life.

Excess amounts of heavy metals in our body increase oxidative stress. Scientists find that excessive amounts of heavy metals in human tissue may increase the levels of free

radicals and consequently produce oxidative stress. This increase in free radicals can promote unhealthy changes or kill the cells that make up our tissues and organs and lead to serious disease conditions. Several metals have the potential to cause serious organ damage. The most important of these are mercury and arsenic.

### *Mercury*

Mercury, one of the most toxic metals, is present everywhere in our environment. High levels of mercury are found in much of our natural waters, soils, and even food supplies. The sources of this heavy metal contamination are fabric softeners, printer inks, dental fillings, house paints, common plastics, medications, wood preservatives, cosmetics, and various industrial products. The seeds and grains we eat are often treated with mercury compounds to discourage the growth of fungi. Normally, if mercury accumulates in our bodies to toxic levels, it causes several serious conditions if not removed from our tissues. Acute ingestion of mercury-containing chemicals brings about thirst, burning sensations in the throat, abdominal pain, and vomiting. Once mercury salts are in the bloodstream, they travel to the kidneys and may produce acute kidney failure. Direct inhalation of mercury vapors can cause an acute, life-threatening chemical pneumonia. Chronically high levels of mercury are associated with immunosuppression, neurological disease, environmental allergies, arthritis, hair loss, muscle weakness, and death.

The silver fillings that most dentists use are actually combinations of 50 percent mercury, 25 percent silver, and 25 percent something else (i.e., nickel, tin, or copper). All of these metals are potentially toxic, but mercury is probably the most poisonous.

Alpha lipoic acid chelates mercury. The conventional medical treatment of acute mercury poisoning includes causing a person to vomit, administering activated charcoal, and providing a laxative to promote diarrhea. The treatment for chronic mercury poisoning includes removal from the source of mercury and the use of pencillamine. Pencillamine is a metabolite of penicillin and is associated with various adverse effects, including inhibition of wound healing and blood vessel damage. Alpha lipoic acid has been demonstrated to chelate high levels of mercury and allow the patient to excrete it from the body by way of the gall bladder.<sup>17</sup>

### *Arsenic*

Another toxic metal found in many products in our environment is arsenic. High levels of this metal are found in many city water systems. Arsenic can also be found in smog, tobacco smoke, pesticides, and many industrial chemicals. Symptoms of acute poisoning appear within twelve hours following exposure and include abdominal pain, vomiting, diarrhea, and muscle cramps. The symptoms of chronic poisoning are more vague and often confused with the symptoms of neurological diseases such as ALS (Lou Gehrig's disease), Parkinson's disease, or multiple sclerosis. Are many of the people diagnosed with these neurological conditions actually suffering from some toxic presentation?

The conventional treatment for arsenic poisoning is the injection of complicated drugs that have antioxidant and metal-chelating capacities. Alpha lipoic acid, too, chelates arsenic. In 1960, it was found that arsenic could be easily removed from the blood and tissues of dogs with ALA.<sup>18</sup>

### *Other Metals*

Among other toxic metals that ALA and its metabolite DHLA can chelate are copper, excess iron, cadmium, excess

calcium, zinc, and lead. Dr. Lester Packer and his group of researchers from the University of California have done a great deal of exciting research on antioxidant biochemistry.<sup>19</sup> Their work suggests we are just beginning to understand the significance of ALA as a therapeutic agent for heavy metal poisoning.



# Cancer

## *Can ALA Treat and Prevent Cancer?*

A few days ago, on a national television show, I saw an oncologist (a conventional cancer specialist) discussing cancer. She said, "We still don't know what causes cancer. But we have surgery, chemotherapy, and radiation to treat it." I could only shake my head and ask myself, Where has she been for the last twenty years? The majority of cell biologists know exactly what causes cancer. Why didn't this medical doctor who has worked with the disease for fifteen years—touting herself as an expert—know what causes cancer?

This brings back an experience I had many years ago when I was pathology resident. I was assigned the job of biopsying a breast tumor of a young female doctor whom I knew personally. She was still on the operating table upstairs as the surgeon waited for a pathology judgment concerning the possibility of a cancerous tumor. After slicing and preparing the microscopic sections, I was to project this slide onto a screen viewed by several pathologists.

The chief took one look at the screen and told me to inform the surgeon that he should remove the woman's breast. This slide looked unlike other cancer slides to me,

and I respectfully asked the chief pathologist why he thought it was cancer. He indignantly told me that the tissue was bluer than that surrounding it. The chief was very upset that I had questioned his professional judgment.

As a professional biologist, medical doctor, and student of pathology, I was in search of another type of answer. Were there any perceptible changes in the cell nuclei and, more specifically, in the chromosomes themselves, that indicated cancer? Perplexed, I informed him that to a cell biologist, a more precise answer was necessary. He advised me never to speak to him again and stomped out of the room. The pathologist could not discuss the possibility that the blueness and cell irregularity in the tumor were actually the result of some infectious process rather than cancer. This incident had a profound effect on me. I now believe, in many cases of cancer diagnosis, we often have a case of uniformed doctors leading uniformed, trusting, patients.

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*Perhaps the wisest way to "treat"  
cancer, is before it even develops in  
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guarding diet.*

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The surgeon proceeded to remove the young woman's breast, and she did very well. But did she actually have breast cancer? Today, and even then, scientific methods are available to determine precisely whether a tumor is cancerous. In this particular case, the decision was left to an egotis-

tical senior pathologist who was more interested in catering to a busy surgeon than caring about the patient's welfare or answering an honest question from a second-year doctor in training. Sometimes I wonder about the cancer statistics. How many of the statistical cures were not actually cancer in the first place?

Recently, in a *Journal of Family Practice* editorial, J. Thomas Cox, M.D.,<sup>1</sup> discussed some of the current problems concerning the diagnosis of cervical cancer. He suggested, in many cases, that the inspection of cells for the diagnosis of cancer is subjective, as much an art as a science. He added, "Although artificial categories have been set up to divide a continuum of abnormal cells, nature's paintbrush is not as specific as we would like." It appears that there is as much subjectivity in the diagnosis of cancer as there is science. In this country, the trend may be toward the overdiagnosis of cancer because of the possibility of malpractice if the doctor makes the wrong diagnosis.

## What Is Cancer?

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Cancer is defined as a malignant tumor of disorderly cells that have the potential of nearly unlimited growth. These uncontrolled cells expand locally and/or metastasize (spread destructively) to other tissues and organs.

Most sensible cell biologists know that everyone forms cancer cells many times over their lifetime, but only about 30 percent of us are ever diagnosed with clinical cancer. This tells us that we all are born with the potential to destroy cancer cells effectively using our immune systems. If this is so, disease only develops when something happens that interferes with our normal immune capacities. So, it seems

people with healthy immune systems do not normally develop full-blown, detectable cancer.

In actuality, as with all other serious illnesses, cancer is a multifactorial disease that includes many different ingredients. Cells are designed to perform specific jobs in the various tissues and organs of the body. Normal cells are fastened to one another by use of molecular glue. Most cells are not intended to move freely around the body and enjoy life in other organs. If an abnormal breast cell moves to the liver and begins dividing there, this breast cell is said to have metastasized. These metastatic breast cells have found a way to break the molecular bonds that glued them together and take up residence in another organ. Metastatic cancer cells eat their way through the protective barriers of an organ and march away from their proper organ and overrun other tissues and organs.

Metastatic cancers are normally more menacing than the primary cancer because they interfere with an organ's function. Metastatic cells push normal cells aside and compete with them for energy and food. If a liver is loaded with abnormal breast cells, it can no longer detoxify the body, as a liver should. This situation results in the patient being poisoned to death. If abnormal lung cells move to the brain and replicate, thus forming a metastatic brain tumor, they push the brain cells aside. The unfortunate person with this condition can no longer think effectively and eventually may not think at all.

Today, people are dying at alarming rates of all types of cancers. Hardly anyone in the United States has gone through life untouched by cancer, be it from having cancer him- or herself or having a friend or family member afflicted.

Companies and individual scientists apply for cancer research grants faster than the money can be handed out. There is a race to find the key that will extinguish hu-

mankind's enemy. Biology—the study of life—is the science of the new millennium. Soon biologists will understand many of the mysteries of the body and most of the cellular complexities that lead to cancer. Although today's science explains much of the biochemistry of the cell, we learn more about the complexities of the immune system every day. As this information accumulates, medical doctors will become better educated in this field and will eventually apply the ideas of the molecular biologist to the treatment of disease. Until that time, what should you know to protect your body from cancer?

## What Causes Cancer?

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The development of a cancer is usually a very slow process that often takes place over a period of years or even decades. To most integrative medical doctors, the tumor is not the cancer. The actual disease involves a mutation of a gene or genes in a cell and an immunosuppression allowing abnormal cells to proliferate.

In my work, I have recognized a number of factors that cause immunosuppression. These factors include stressed-out emotional states commonly resulting in an abundant secretion of immunosuppressive hormones, an antioxidant-poor diet, and, among other factors, a tremendous build-up of destructive free radicals that cause mutations. Frequently, if these factors occur over a period of years, metastatic cancer disease may follow.

What, precisely, leads to the cancerous condition? Cells are normally programmed to die when they reach old age by a process called apoptosis (cell suicide). The apoptotic cells die and are replaced by new ones. Dormant cells then divide, grow, and differentiate into normal, serviceable

cells. Eventually, these cells grow old and undergo apoptosis. When they die, more proficient new cells take their places on the necessary biochemical assembly lines of the organ. Apoptosis is not a simple process; it involves a long series of genetically and environmentally controlled processes.

Some cells, such as brain cells and heart muscle cells, live for long periods of time and do not regularly undergo apoptosis. When they actually die, there are not many young and undeveloped cells that can differentiate into functional cells; as a result, if brain or cardiac tissue is destroyed, normally very little regeneration occurs.

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*Free radical damage is being seriously investigated as a cause of many types of cancers.*

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Cells that line our digestive tracts or cover our skin are intended to die soon after they reach full development. These cells have a life span of a week or less, and there are always new, younger cells waiting to take their places. Most organs contain cells that live for a certain length of time and then die by apoptosis. If certain cells become too abundant and collect in the tissues and apoptosis does not occur properly, we have developed a tumor.

Abnormal genes control the unregulated growth of cells. Specifically, with cancer, we have found that at least one gene regulating growth is damaged or absent. Cells containing these defective genes divide and gather in a mass

until each of the cells contains the same dysfunctional gene. When this tumor grows to about one-quarter inch, it secretes hormones that start the process of angiogenesis (formation of new blood vessels). The formation of new blood vessels provides the tumor with food and oxygen. Once angiogenesis occurs, cancer cells break away from their neighbor cells and move through the blood vessels to distant places in the body. Once there, these outlaw cells divide and form the metastatic tumors. Biologists have been telling medical doctors for thirty years that it is possible to destroy cancerous tumors by just giving the patient drugs that interfere with the development of new blood vessels. Why hasn't organized medicine listened to them?

Cancer cells must have some genetic abnormality to survive as cancer cells. This genetic abnormality is the result of exposure to some toxin in the environment, a virus infection that disrupts DNA, or the deadly invisible bullets of radiation. Next, this genetic abnormality must allow the cancer cells to break free of the bonds that glue them together. Cancer cells must also be able to produce new blood vessels that provide them with food and oxygen and enable them to migrate to distant sites in the body. These cells must also generate enzymes that allow them to eat through the tissue barriers. Most important, cancer cells must fool the immune system into thinking that they are normal cells or grow so rapidly that an impaired immune system cannot keep up with destroying them.

## Treating Cancer

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Cancer treatment may be approached in different ways. Conventional therapy entails a combination of radiation and chemotherapy; immunotherapy aims to enhance the

patient's immune system to better fight the disease. Perhaps the wisest way to "treat" cancer, however, is before it even develops in our bodies, through a sound, safeguarding diet.

### *Conventional Medical Treatment*

What can medical doctors do to treat cancer today? First, if possible, they must separate the cancer tumor from the healthy tissue by surgery. It is always probable that some cancer cells are left behind, and for that reason radiation is often used after the surgery. Radiation creates increased numbers of free radicals in the tissue, and free radicals induce apoptosis of thousands of cells in this region. Doctors hope that radiation therapy kills more cancer cells than normal cells and that the radiation will not start a new cancer.

Following radiation, conventional doctors may inject chemotherapeutic drugs into the body. These treating physicians want chemotherapy to act more destructively on the quickly dividing cancer cells than the normal cells. But what about the damage that chemotherapy does to the normal rapidly dividing cells of the immune system, skin, hair, and other tissues? Oftentimes, chemotherapy does more damage than it does good.

### *Immunotherapy*

One very sensible scientific approach to the treatment of full-blown cancer, and I believe the most practical and effective treatment, is immunotherapy. These treatments were developed on the assumption that a cancer could not develop in a person with a fully functional and competent immune system. The goal of this therapy is to teach the immune system to kill the cancer as it should have done in the first place. In this way, and only in this way, we have the



potential of actually curing cancer. Once cancer develops, tumors often attain the ability to secrete large amounts of suppressing chemicals to protect themselves from the cells and antibodies of the immune system. If the immune cells are carefully taught, with the use of cancer vaccines, to hone in on and kill a particular-looking type of cell, cancer cells have no effective defense against the natural healing properties of the body.

Over the last hundred years, many scientists and doctors have used unrefined immunotherapeutic techniques, with various degrees of success, in their treatment of cancer. In the 1890s, Dr. William Coley developed a cancer vaccine from specially treated disease-causing bacteria. This therapy was able to stimulate a patient's immune system to incite an attack on cancerous tumors. Some evidence indicates that Dr. Coley's bacterial vaccine produced many therapeutic successes. Alas, it seems the medical community was not ready to accept such a simple approach, since radiation therapy had just become available and was thought to be an innovative cure for cancer.

When I was an undergraduate biology student in Chicago, I became acquainted with a physician named Andrew Ivy. At one time, he was a well-respected professor at the University of Illinois Medical School. Two brothers by the name of Durovic asked him to test a theory that cancer could be cured with antibodies specifically tailored to fight an individual cancer. Being a scientist with an open mind and vision, Dr. Ivy liked the idea. He and the Durovic brothers began testing the concept. They removed small parts of an established cancer, pulverized it, and injected it into an animal that manufactured the required antibodies necessary to destroy that particular cancer. Ivy and the Durovics injected a serum, derived from the blood of the animal that contained antibodies against the cancer, into a patient's

bloodstream. The patient's tumor regressed in size. Ivy thought that this treatment had proven very successful and that immunotherapy for cancer should be tested on a large scale. Such testing, however, did not occur.

Dr. Ivy's immunotherapy idea was so new and different from the conventional cancer therapies that he soon became an outcast in his own profession. One day, he had a respected position as a dean at one of the most respected medical schools in the country; the next day he was out on the street. It appears that Dr. Ivy and the Durovics sustained the defamatory criticism that practically all free thinkers suffer when they develop new theories. They were defamed and subjected to numerous politicized court cases because of their new approach. Eventually they died without ever seeing any widespread acceptance of immunotherapy of cancer.

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*ALA is reported to neutralize the toxic effects of radiation therapy in animals and is demonstrated to alleviate the harmful effects of cancer chemotherapy in humans.*

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Today, immunotherapy is alive and well in many reputable research laboratories and university hospitals across this country, although it is still not widely accepted by the average practicing doctor. Many immunotherapy scientific teams are working on vaccines and studying innovative gene

treatments for cancer. As of yet, these life-saving therapies are not available for the average cancer patient.

Although things may seem grim, this predicament concerning the prevention and treatment of cancer is not as hopeless as it may appear. We, as individuals, can accomplish much to prevent cancer with a nutritional approach. Each of us must take responsibility for our own health.

There is a great amount of scientific evidence demonstrating that various nutrients can stop, and possibly reverse, the development of malignant diseases. So, you can either wait until you get cancer or begin a plan of attack on the free radicals invading your body. It's a very rare day when a doctor will give you a plan to prevent cancer. Prevention starts and ends with you.

## Understanding the Role of ALA in Discouraging Cancer

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Today free radical damage is being seriously investigated as a cause of many types of cancers. As we have seen, free radical damage actually decreases the amount of energy produced in the cell because it interferes with the integrity of the mitochondrial membranes where the energy is produced. The organs containing damaged mitochondria cease to function normally and lose their energy reserves. When the damage occurs in the pancreas, it may lead to diabetes. When it takes place in the heart, coronary heart disease may result.

Free radicals also interfere with the ability of the ribosome to synthesize normal proteins, and they damage all of the cellular membranes. Free radical damage to membranes allows leakage, and the injury compromises the functional integrity of the cell. Free radical damage to the DNA changes the true nature of the cell. As a result of this type

of injury, the damage may change who we are and who we will become.

For instance, breast cells or lung cells that have been subjected to free radical damage from foreign industrial chemicals may grow wildly and forget who they are. In essence, they become cancerous. Less extreme damage to DNA decreases the efficiency of cell metabolism and causes a person to wrinkle more easily or deposit more fat than protein.

Alpha lipoic acid is a very potent antioxidant, so it is remarkably effective in the nullification of free radicals and other dangerous toxins. ALA is reported to neutralize the toxic effects of radiation therapy in animals and is demonstrated to alleviate the harmful effects of cancer chemotherapy in humans.<sup>2</sup>

Alpha lipoic acid, by itself, may play a role that discourages the development of cancer. It may also reverse or hold off the malignant syndrome. But to understand how this occurs, we must first understand two important concepts: signal transduction and transcription factors.

### *Signal Transduction*

Signal transduction is a popular term to the biologist but is rarely heard, yet, by the practicing M.D. An understanding of this process is essential for an understanding of cancer.

In 1994, I gave a series of lectures on signal transduction to a large audience of health professionals at a national conference in Albuquerque, New Mexico. I was surprised when, after about an hour, at least half of the audience sneaked out of the large conference room. Later, when I had an opportunity to question some of the people who slipped out, they said such information was far too technical for practicing doctors. Apparently, they just wanted to know

some simple methods for treating patients, not some “high-level” biochemistry. One doctor told me the only course he had had in medical school on this subject was so difficult and stressful that he did not want to hear anything about biochemistry again. Sadly, this is how many doctors feel about the subject. Unfortunately for these doctors’ patients, knowledge of biochemistry and immunology is essential for understanding cancer and its treatment.

Signal transduction is a concept taught in every modern biochemistry and immunology course. It concerns the biochemical message that is passed from the envelope of the cell to the nucleus of the cell. Simply explained, when a messenger molecule binds to a receptor on a cell membrane, the cell membrane undergoes a chemical change. This change triggers a series of reactions that pass, in a bucket brigade fashion, from the cell membrane to the genes in the nucleus of the cell. Once the messenger molecule binds to the cell membrane, a preprogrammed sequence of events takes place within the cell. In the cell, certain processes remain dormant until a special messenger molecule triggers the signal by binding to the cell membrane.

One excellent textbook of cell biology eloquently compares the activating effect of a messenger molecule with the stimulation of a human reflex.<sup>3</sup> To quote the authors, “In the knee-jerk reflex, for example, the nerve connections are already in place that can cause the leg to extend in response to a tap just below the knee, but the tap is needed to activate the reflex.” In an analogous way, a messenger molecule can initiate a cascade of chemical reactions in the cell that are already in place but not immediately active.

A normal cell becomes cancerous when a mutation in one of its proto-oncogenes (genes that when mutated may lead to cancer) occurs. Cells with these mutations may remain dormant for many years and never manifest themselves

until a special signal messenger binds to the membrane of its cell. This messenger molecule may be a free radical or some other carcinogen. This messenger molecule may activate a strategic developmental pathway within a cell that leads to the cancerous condition. These molecular signals may be transmitted by other abnormal cells or, in some cases, parasites.

### *Transcription Factors*

Transcription factors are proteins that facilitate gene expression—that is, they cause genetic material to do something. When human cells are exposed to hostile environmental conditions, special genetic responses begin. A specific type of stress triggers a special collection of genes.

For example, a viral infection may stimulate transcription factors' triggering genes to code the production of interferon. This should protect other cells from viral infection. High temperatures may also evoke the production of special substances termed heat-shock proteins that protect the cell from hyperthermia. Cell biologists believe that free radicals and other toxins may cause transcription factors to initiate a series of genetic reactions that result in cancer.

Several transcription factors have been described, and some of them appear to be influenced by free radicals. A particular transcription factor, NF kappa B, partakes in the activation of genes stimulating immune actions. Some of the stimuli activating NF kappa B are cytokines (cell message chemicals), nuclear radiation, HIV viruses, and, among many others, protein kinases (chemical activators that tell cancer cells to start dividing). NF kappa B activity is especially important to the cells of the immune system because this system is conscious of the fact that deleterious agents usually activate this transcription factor.

It is thought that NF kappa B, usually found dormant in the cytoplasm of a cell, is not activated until some signal is given in the form of a harmful chemical messenger that attaches to the cell membrane. This harmful messenger may be a free radical or other carcinogen. Once activated, NF kappa B travels from the cytoplasm to the nucleus of the cell and may activate genes that might change a potentially malignant cell into an absolutely malignant cell.

### *ALA and the Treatment of Cancer*

What does alpha lipoic acid have to do with all of this? ALA appears to have the ability to modify gene expression through its influence on transcription factors. It seems that it can accomplish this indirectly through its quenching effect on free radicals and directly through the stabilization of the transcription factors. This effect is exciting because, if it is true, ALA has the potential to stop cells that are genetically programmed to one day become cancerous from ever becoming cancerous. It is then possible that ALA, if used correctly, could change a fatal malignant disease into a chronic disease that is totally treatable.

If this subject grabs your interest and you are on-line, go to the National Library of Medicine Web site, and type in "signal transduction," "transcription factor," or "NF kappa B." You will be astonished at the huge number of research and clinical medical papers on these subjects.<sup>4,5,6</sup> Biologists and medical researchers are reversing cancer today at several medical research facilities around the world. When a greater number of practicing oncologists understand, accept, and develop a working understanding of cellular and molecular biology, cancer will become a curable disease for the general public.

## ALA's Helpers in Cancer Prevention

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Alpha lipoic acid is an incredible antioxidant when used alone, but it is even more beneficial when supplemented with vitamins and other antioxidants. You've already read about some of the amazing effects of ALA. This chapter concerns a discussion of the vitamins and supplements that our bodies need to help ALA perform optimally.

### *Vitamin A*

Vitamin A is shown to reduce the risk of many epithelial cancers (esophagus, bladder, stomach, skin, etc.) and malignancies of the blood and lymph systems (leukemia, lymphomas, etc.) by supporting immune function. This vitamin is demonstrated to enhance the function of macrophages that eat cancer cells and stimulate the activity of cytotoxic T-cells that kill cancer cells.

Vitamin A may even be used as a complementary treatment with conventional cancer therapy. In one study of thirty-seven women with breast cancer, chemotherapy was vastly more effective if the women had high levels of vitamin A in their blood.<sup>7</sup> Vitamin A also upholds the integrity of skin and mucous membranes of the respiratory system, digestive tract, and sexual organs. These surfaces, if healthy, provide barriers against invading microorganisms or other types of alien cells.

Carotenes are naturally occurring, colorful pigments from higher plants that have received much attention as immunoamplifiers over the years. Beta-carotene is probably the best known of the carotenes. As far back as 1931, some researchers became aware of the immune-enhancing powers of these plant products. Children who had high blood carotene levels were found to have fewer illness-related ab-



sences from school than children with low blood carotene levels.<sup>8</sup> In 1985, researchers discovered they could increase the number of virus- and cancer-fighting T-cells in the bloodstream of study participants by 30 percent in just seven days with a daily oral dose of 300,000 IU.<sup>9</sup>

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*Although things may seem grim, this predicament concerning the prevention and treatment of cancer is not as hopeless as it may appear. We, as individuals, can accomplish much to prevent cancer with a nutritional approach. Each of us must take responsibility for our own health.*

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At one point, researchers thought all carotenes were converted into vitamin A and that this conversion was the reason carotenes boosted immune function. However, further research demonstrated that this previous assumption was not true. Researchers explained that the carotenes, and not necessarily vitamin A, were responsible for the immunoaugmentation. One Israeli study showed that tomatoes, a fruit rich in carotenes but containing very little beta-carotene, significantly reduced cases of gastrointestinal

cancer.<sup>10</sup> Today, nutritional scientists know carotenes have the capacity to boost the immune system, thus protecting us against cancer.

### *Vitamin C*

Vitamin C protects us against cancer in many ways. It has the ability to increase the strength of human blood including the B-cells, T-cells, and macrophages. B-cells produce antibodies that mark cancer cells for destruction, and T-cells actually destroy cancer cells. The macrophage (big eater) consumes the cancer cell and digests it. Vitamin C has been shown to increase interferon levels in the blood and protect against viral diseases, neutralize potential cancer-causing free radicals in the bloodstream, and increase levels of the cancer-fighting intracellular antioxidant glutathione.

Alpha lipoic acid is incredibly effective when used in addition to vitamin C. Vitamin C can effectively destroy cancer cells, neutralize toxic products that may cause cancer, and invigorate the immune system in a watery environment. ALA can also do all of those things. Additionally, it can also recycle used-up vitamin C. When alpha lipoic acid is present, vitamin C can do its chores over and over again.

Numerous studies describe how vitamin C protects us against many forms of cancer. One paper suggests that this substance plays an important role in protecting us against lung cancer,<sup>11</sup> and another study showed that people with low levels of serum vitamin C were more inclined to develop malignant disease.<sup>12</sup>

In another paper reviewing the results of various other studies, it was shown that vitamin C, at a dose of less than 400 milligrams a day, solidly protected us against the development of malignant disease. Additionally, another study of

more than four thousand men showed that patients with gastric cancer had the lowest serum vitamin C levels.<sup>13</sup> Another study demonstrated that patients receiving radiation therapy for cancer did much better if they ingested 5 grams of vitamin C every day.<sup>14</sup>

### *Vitamin E*

Vitamin E is often considered to be an ideal antioxidant because it functions in fatty environments. Under fatty conditions, it may prevent a free radical cascade that could otherwise cause mutations and membrane damage. Thus, it can prevent normal cells from becoming cancerous. Vitamin E is necessary for the proper functioning of the immune system and helps produce the cells that poison and eat cancer cells.

Alpha lipoic acid can do many of the jobs of vitamin E. In addition, ALA also recycles vitamin C. Vitamin C, in turn, recycles used-up vitamin E. Therefore, when ALA is present in sufficient amounts, both vitamins C and E are revived and can once again become active in accomplishing their jobs that prevent cancer.

Vitamin E can accumulate in the membranes of cells and protect us from cancer-causing free radicals. In this way, it also protects us from environmental toxins and causes our membranes to become more stable. Vitamin E works along with the mineral selenium to detoxify injurious chemicals, and it can enhance cellular immunity and antibody response. In very high doses, vitamin E may actually be harmful. As I have said repeatedly, for your health's sake, let a knowledgeable integrative medical doctor manage your vitamin and supplement program. In doses of approximately 400 IU a day, this antioxidant can stimulate the disease-fighting cells in the blood to function normally.

Once more, cancer patients often show up with very low levels of vitamin E. Vitamin E in these patients is depleted because it is used up in the snuffing-out of the abundant toxic free radicals that are produced during the malignant condition.

### *Glutathione*

Glutathione is the most important intracellular antioxidant. It appears as if this substance must be assembled within the cell to be effective. Glutathione, along with selenium, forms enzyme systems that defend the body against the cancer-causing free radical products of oxidative stress. White blood cells require high levels of glutathione to destroy invading microorganisms and kill cancer cells. In normal human white blood cells and cultured cancer cells, alpha lipoic acid has been demonstrated to increase the production of and recycle glutathione.

### *Selenium*

Selenium is found in abundant amounts in many rich soils and is absorbed by the roots of green plants. We obtain this valuable mineral by eating green leafy plants. In regions where the soil is poor in selenium, people are more likely to develop malignant disease. Low levels of selenium result in poor immune cell function. It is thought that selenium fights cancer directly as a powerful antioxidant and indirectly, too, because it increases the activity of glutathione peroxidase. This important enzyme increases the power of, and influences the development of, the cancer-fighting cells (white blood cells) of the immune system.

Although we need only tiny amounts of selenium to stay healthy, its importance should not be underestimated.

People who are suffering from AIDS, inflammatory bowel disease, cancer, autoimmune disease, and various other serious conditions characteristically have low serum selenium levels. Men with low selenium levels often have low sperm counts. Conversely, selenium in large doses can be very toxic, and animals that feed on plants containing excessive selenium often die. People can also be poisoned and killed by excess selenium, with the first symptoms being fatigue and garlic breath.

Studies have shown that selenium deficiency lowers our resistance to infection and supplementation with selenium reestablishes our immune function.<sup>15</sup> One well-recognized 1996 study in the *Journal of the American Medical Association* shows a substantial reduction in cancer mortality and cancer incidence (of specifically colon, rectal, lung, and prostate) in patients receiving selenium supplementation of 200 micrograms a day.<sup>16</sup> Selenium is much more effective in the presence of alpha lipoic acid because ALA increases the production of selenium's cancer-fighting partner glutathione.

# Liver Function

## *The Important Role of ALA*

**A**s you learned in the introduction to this book, I first became acquainted with alpha lipoic acid more than twenty years ago, when I was a medical resident at a large teaching hospital in Cleveland, Ohio. My introduction was in connection with mushroom poisoning of the liver. This type of toxicity, mushroom poisoning, can be used as a typical model of any severe and acute injury to the liver.

### Why Is the Liver So Important?

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The liver is one of the most important organs in the human body. When it is destroyed, you are bound to die a slow and horrible death. The liver, located in the right upper quadrant of the abdomen, under the diaphragm, is divided into the right and left lobes. The right lobe is larger and is further divided into two more lobes. A large fibrous ligament separates the right lobe from the left lobe and also serves as the liver's attachment to the body wall. The liver is covered with a capsule through which run numerous arteries, veins,

lymph vessels, and nerves. Because of the liver's immense nerve supply, any swelling causes pain in the right upper quadrant of the abdomen.

The liver performs a multitude of metabolic functions; because of this, several large arteries and veins supply the liver with blood. Almost 25 percent of the oxygen-loaded blood pumped from the heart goes directly from the aorta (the big artery that leaves the heart) to the liver through a huge blood vessel called the hepatic (liver) artery. The large hepatic portal vein carries the food-laden blood from the digestive tract to the liver. The hepatic portal vein carries blood that is very low in oxygen.

Under the microscope, the liver lobes are further divided into hepatic lobules. Each liver lobule contains plates of hepatocytes (functional liver cells) that have a remarkable ability to regenerate when injured. Between these plates of hepatocytes are sinusoid cavities through which flow a mixture of blood from the hepatic artery (high oxygen) and blood from the hepatic portal vein (lots of food).

The blood from these sinusoids collects into a larger central vein, in the center of each lobule, and this blood drains into the large hepatic vein carrying blood to the vena cava and on to the heart. The liver sinusoids are lined with very important macrophages (called Kupffer's cells) that eat harmful substances and billions of harmful bacteria that find their way to the liver from the digestive tract. Small bile canals carry the waste products of the hepatocytes, and these bile vessels run through the liver and eventually drain into the common bile duct.

Bile is the waste product of the liver cell and is a yellow-green fluorescent fluid that contains the bile salts. The bile salts are necessary for the proper digestion of fats. Bile is squeezed into the upper intestines by the gall bladder, reabsorbed in the lower small intestines, and returned to the liver to be used again.

One of the liver's functions is to destroy and process old red blood cells. When the red blood cell's membrane is digested, bilirubin runs out of it. This substance gives bile its dark green color. The Kupffer's cells that eat the old red blood cells, in addition to eating the bacteria from the gut, complete the processing of worn-out red blood cells in the liver.

Another function of the liver is the storage of blood. Blood is released from the liver when the body needs it. In case of a hemorrhage, the liver releases large amounts of blood to stabilize the blood pressure.

The liver also synthesizes substances necessary for the normal clotting of blood. Vitamin K is synthesized by the bacteria in the colon and is a necessary ingredient for the production of the clotting factors that are manufactured in the liver. Bile formed in the liver is also necessary for the proper absorption of vitamin K from the colon.

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*When I injected alpha lipoic acid into mushroom poisoning patients, they soon began to improve.*

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The liver is an organ that prepares the nutrients that we obtain from food. It transforms fats and proteins into fuel for the body. The fat that we eat is carried to the liver, broken down into fatty acids and glycerol, and burned to produce large amounts of energy or released into the blood as lipoprotein carrier molecules. The lipoproteins are carried to the fat cells for energy storage, or they may be oxidized. The oxidized low-density lipoproteins form the cell plaques



of early blood vessel disease (ASVD). The liver also manufactures cholesterol, a normal part of every healthy cell membrane and a necessity for the synthesis of hormones.

Many of the proteins necessary for life are made in the liver. Proteins perform many jobs in the body: regulating various chemical reactions as enzymes, contracting muscles as actin-myosin, maintaining fluid balance as albumen, protecting against foreign invaders as antibodies, forming a fiber framework for the body as collagen, transporting oxygen as hemoglobin, and serving as a source of energy as food. When the liver is injured, certain protein enzymes leak out and can be observed in the blood as a measure of liver damage. ALT, AST, and LDH are common liver enzymes that appear in the blood during liver injuries.

Yet another function of the liver is binding excess glucose molecules together into long polysaccharide storage molecules called glycogen (animal starch). When the blood sugar is low, the liver breaks down the glycogen and releases glucose molecules into the blood. The liver also converts glucose to fat. If all the glycogen is used up, it can change fats and amino acids to glucose.

One of the most important functions of the liver is the removal of poisons. The liver normally filters and detoxifies poisons taken into or produced by our bodies. Liver detoxification occurs in two main stages. Phase I is a series of reactions (p450 enzymes) that usually change a harmful substance into a less harmful substance. During the various steps in this process, fat-soluble toxins are made more water-soluble. Some toxins can be excreted after this stage. However, many of the molecules are still very poisonous and must be further detoxified by a series of reactions known as phase II detoxification.

Usually, the products of liver detoxification are rendered harmless. In some cases, though, the end products

become toxins in themselves. For example, the chemicals resulting from alcohol detoxification can, in high doses and over a long period of time, destroy the liver.

The liver also serves as the storage site for some vitamins and minerals. Vitamins B12, E, K, and D are all stored in the liver for relatively long periods of time. Vitamin A can be stored in the liver for years. One liver protein, ferritin, binds to iron so it can be stored in the liver and released for the construction of red blood cells.

## When the Liver Is Diseased

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The liver is essential for life because, as just described, it performs so many indispensable jobs: maintaining red blood cells, removing bacteria from the intestinal blood, storing blood, producing proteins responsible for the maintenance of blood pressure, synthesizing clotting factors, triggering the normal metabolism of foods, detoxifying of poisons, storing vitamins and minerals, and producing bile. It's no wonder, then, that poisoning a liver may lead to life-threatening problems. Other liver problems may be the obstruction of the vessels (ducts and blood vessels), infections, tumors, and inflammation (hepatitis).

If the pressure becomes abnormally high in blood vessels leading from the digestive tract to the liver, a condition called portal hypertension results. This occurs as a result of any long-standing insult to the liver and may lead to secondary conditions that could be life threatening. For example, if pressure continues to build up in the veins of the digestive tract in the esophagus, esophageal varices may form and burst, causing massive bleeding and death. This condition often occurs in people who have liver disease secondary to alcohol abuse.

Sometimes, you may notice in long-standing alcoholics that they have a protruding lower belly. This is often caused by an accumulation of fluids in the abdomen (ascites). High pressures in the portal vein system cause ascites and force water and other substances through the blood vessel wall and into the cavity of the abdomen. The high pressure is the result of the injured liver acting as an obstruction to the normal flow of blood.

In people with diseased livers, blood is often shunted around the liver and is not properly detoxified. These toxins often pass into the brain and cause a mental disturbance. This disorder occurs quickly when the liver is poisoned (mushroom poisoning or acetaminophen poisoning) or slowly if the liver disease is chronic (alcohol liver disease).

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*Free radicals destroy the biological mechanisms in cells and thus can cause cellular death. ALA is a superb free radical scavenger, an even better free radical scavenger than glutathione or cysteine.*

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When I worked as an emergency room doctor, I often saw young people with liver destruction as a result of acetaminophen overdoses. You can buy this medicine over the counter at any drugstore. These people did not realize that

an overdose of acetaminophen is much more destructive to the liver than even a narcotic overdose.

Sometimes, in advanced liver disease, toxins build up in the blood and can poison other organs. This condition often results in acute kidney disease. This problem can lead to shock and death.

Several viruses attack the liver and cause a disease called viral hepatitis. Hepatitis just means an inflammation or infection of the liver. Viruses are not technically living disease-causing organisms; they are just large infectious chemicals. Hepatitis A, B, and C are the most common types of diagnosed viral hepatitis. Hepatitis A is a small RNA virus caught by eating food that has been contaminated by the feces of some person who already has the disease. It is very common, often mild, and usually does not become chronic.

Hepatitis B is caused by a large DNA virus and is usually picked up from the exchange of blood or sexual fluids with a person who is already infected. We often find this disease in people who are intravenous drug users. Hepatitis B is often severe and can become chronic.

An RNA virus causes hepatitis C. It is also passed from person to person by the exchange of blood and sexual fluids. There is often a long chronic stage, which means a long period of liver inflammation that may last for years following the acute stage. Some scientists believe that hepatitis B and C viruses are contributing factors to liver cancer. I think most viruses can potentially cause cancer if they mutate the host's DNA and if the person has a weak immune system.

Many other causes of infectious hepatitis exist, but doctors in the United States do not often recognize these. Years ago, Dr. Donald Rogers told me a story about a young woman he met while he was a professor at Columbia University in New York. The nineteen-year-old college student was very depressed and told him she was diagnosed

with a primary cancer of her liver. She had undergone all of the tests, and the tumor was growing larger and spreading more rapidly each day.

Dr. Rogers was a good scientific detective, and after a great amount of questioning, he found out that she was very fond of salads containing watercress. Dr. Rogers ran down the source of this vegetable. It grew along a stream on a farm in upstate New York. Sheep regularly grazed on the plants along this stream and also regularly defecated there. Flatworm parasites called flukes are common in the feces of sheep. After some urging by Dr. Rogers, some additional testing was done, and the young woman was shown to have accumulations of medically treatable liver flukes and not cancer of the liver. In this case, the young woman had hepatitis caused by a parasite. Parasite hepatitis is one of the most commonly diagnosed diseases in the world. In Mexico, I saw this disease caused by parasitic amoebas regularly. In the United States, during the 1930s, this disease was epidemic and caused hundreds of deaths.

## Free Radicals and the Liver

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A common cause of liver disease is poisoning. Some of the hundreds of poisons affecting the liver are large doses of acetaminophen, alcohol, cleaning fluids, industrial chemicals, and fungal toxins (including aflatoxins and mushroom toxins). These poisons can be dangerous free radicals or converted to free radicals. The injury to the liver cell begins when the toxin comes in contact with its cell membrane. This leads to a cascade of chaos in the cell.

Free radicals often damage the membranes and organelles of a cell by a process called lipid peroxidation. During lipid peroxidation, the free radicals change the fatty

material in membranes, rendering them useless. These free radical reactions lead to chain reactions that further destroy the cell.

Mushroom toxins are good examples of liver poisons. Some of them are known to generate free radicals that destroy the organelles and various biochemical systems of the cell. They are also known to interfere with the integrity of the RNA polymerase system, so that no new proteins can be produced. Hepatotoxic (poisonous to the liver) mushroom poisons specifically destroy RNA polymerase II, which is the enzyme that transcribes DNA into, ultimately, messenger RNA and thus controls protein production. Any substance that destroys RNA polymerase stops protein production and causes the cell to die.

From laboratory studies, it appears that the toxins almost completely bind to the hepatocyte about one hour after ingestion. So why does it take about twelve hours or more for the patient to show symptoms? The symptoms result from a reduction in protein synthesis. Some scientists believe the delay in apparent symptoms occurs because there is a reserve of messenger RNA in the liver cell, and the cell can continue to function until this is all used up. This process usually takes at least twelve hours. Ultimately, the cells die if the business of RNA polymerase is not restored.

## ALA and the Liver

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When I injected alpha lipoic acid into mushroom poisoning patients, they soon began to improve. After about two weeks, their liver function tests returned to normal and they felt fine. How, then, did ALA reverse their potentially deadly toxic state? ALA has many modes of action. Some scientists believe ALA reverses poisoning by competing for binding

sites on the carrier proteins that bring the toxins to the liver. Carrier proteins are analogous to a passenger train going to the liver, with only a specific number of seats (binding sites). Large passengers (poison molecules) start crowding their way onto the train (carrier protein), but the smaller, swifter passengers (ALA molecules) slip in under the large passengers and take their seats (binding sites) on the train (carrier protein).<sup>1,2</sup> Consequently, the toxins cannot take the train to the liver, and the liver is saved from being poisoned.

Well, that might work before the poisons get into the hepatic portal vein (blood vessel from the intestines to the liver). But if the train has already arrived at the liver with the toxins, how can ALA help then? When toxins come in contact with cell membranes, they act as free radicals do. Free radicals destroy the biological mechanisms in cells and thus can cause cellular death. ALA is a superb free radical scavenger, an even better free radical scavenger than glutathione or cysteine. This is because it has two thiol (sulfur) groups to neutralize free radicals, rather than one thiol group on its molecule.<sup>3</sup> So, ALA protects the liver cells from toxins by neutralizing damaging free radicals.

A large group of scientists in the 1960s and 1970s believed ALA helped people with liver disease because it was an essential ingredient in the Krebs cycle. This process is the major energy-producing process in our bodies. The Krebs cycle takes place in the energy-producing powerhouse, the mitochondrion. These researchers also noted severe mitochondrial damage on examination of autopsy samples of people who had died from liver damage. Because of this research, many European clinicians administered ALA to liver patients and often saw amazingly good results.

The mitochondrion brings up the subject of glutathione. This protective intracellular free radical scavenger is found at high levels in healthy mitochondria. Scientists

have shown that poisons dangerously lower the amount of glutathione.<sup>4,5</sup> Other scientists report ALA to greatly increase the levels of additional glutathione and recycle used-up glutathione. One study reports that a little ALA could raise the levels of glutathione by 30 to 70 percent.<sup>6</sup> So, if the glutathione levels in a cell are kept up to a satisfactory level by ALA, even if the cell is poisoned, perhaps the cell will recover and not die.

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*So, if the glutathione levels in a cell are kept up to a satisfactory level by ALA, even if the cell is poisoned, perhaps the cell will recover and not die.*

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Other researchers have demonstrated that alpha lipoic acid can help glucose enter the injured cell.<sup>7</sup> Some have even shown that liver regeneration can be stimulated by injections of insulin.<sup>8</sup> Insulin promotes the entrance of glucose into the cell. So, among other mechanisms by which ALA protects and stimulates good cellular health, we see that it can increase intracellular glucose levels. This is a good thing because, in this way, it provides the fuel necessary for the mitochondrion powerhouse. This energy can be used for the increased cell divisions that are necessary for the regeneration of a severely damaged liver.

There is another even more fundamental way that ALA may protect the liver from poisons, especially mushroom toxins. You may remember that transcription factors



are proteins necessary for the RNA polymerase system's identification of chemical messages (see chapter 5). Transcription factors are responsible for the expression of our genes. They activate the production of important cell products through RNA polymerase II. It's thought that liver toxins initiate the activation of certain transcription factors and this causes the cell to shut down and die. Alpha lipoic acid has been demonstrated to stabilize some harmful transcription factors.<sup>9</sup> It's then quite probable that ALA may protect the liver from a toxic death by stabilizing and inactivating intracellular transcription factors. An impressive amount of new evidence supports this supposition.<sup>10,11</sup>

I am currently treating several patients with ALA therapy whose liver specialists had told them that they would soon die as a result of their hepatitis C status if they didn't have a liver transplant. Many patients would probably just follow their doctor's advice and sign up for a liver transplant. They would then go through this life-threatening, painful, and complicated surgical operation and take extremely expensive immunosuppressive drugs with many harmful side effects for the rest of their lives. However, the patients I am treating with ALA want first to try a less complicated therapy before considering a liver transplant. All of the hepatitis C patients I'm seeing are also still visiting their liver specialists.

As part of the therapy for hepatitis, I put patients on a very healthy diet, a stress reduction program, and an exercise regimen. They are prescribed ALA, various vitamins, and another liver protective substance called silymarin (milk thistle). The patients are followed very carefully in my office and by other medical professionals. Over the past year, we have seen remarkable improvements in their disease conditions, as measured by the patients' emotional well-being, greatly improved liver function tests, and drastically reduced viral loads in the bloodstream.

All of the patients, except one, are back at work or in school and feeling normal with increased energy levels. The one patient who is not doing as well had been recovering rapidly, but she could not understand how just simple medical treatments, lifestyle changes, and natural substances could heal her serious disease. Even though she was free of all signs and symptoms of liver disease and feeling better than she had felt in many years, she was afraid to continue with an unconventional therapy and decided to go ahead with a liver transplant.

I have worked with ALA on the FDA investigative drug permit since the late 1970s and believe that it is an excellent therapeutic agent for many types of liver disease, as well as for several other serious medical conditions. This drug has only recently come to the wide attention of the academic medical community in this country. Over the past few years, numerous scholarly scientific papers have been published on the substance. I think it is sensible that prior to any serious consideration of liver transplant surgery, a doctor should prescribe a course of alpha lipoic acid.

# Diabetes Mellitus

## *How ALA Can Treat Complications*

**W**hen Mr. Michaels, a sixty-year-old diabetic patient, first consulted me, he had a number of diabetic complications, including burning on the soles of his feet, pain and circulatory problems, and failing eyesight. His internal medicine doctor had told him that these diabetic neuropathies could not be properly treated today with available medicines. He was also informed that, in his case, the pains and circulatory problems would only get worse and might require amputation. His eye doctor had told him that he should prepare for a gradual deterioration of his eyesight due to his diabetic condition and the inevitable macular degeneration that comes with aging.

Given this diagnosis, Mr. Michaels had little to lose from trying a course of ALA. After only three weeks of oral ALA treatment, his health began to change for the better. First he noticed that he was able to read without his glasses. At the same time, he noticed that the constant burning in the soles of his feet had disappeared. It appeared that ALA,

working at the basic cellular level, improved factors associated with the deterioration of his eyesight and also had a positive effect on his peripheral nerve pains.

## What Is Diabetes?

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Diabetes mellitus is a group of diseases with one thing in common: glucose intolerance. The symptoms of diabetes are thirst, weight loss, excessive urination, and hunger. Traditionally, diabetes is acknowledged to have at least two forms, one affecting younger individuals and one affecting older and obese people.

Today, the term *diabetes mellitus* characterizes a number of miscellaneous conditions featuring chronic high blood sugar (hyperglycemia) and disturbances of carbohydrate, protein, and fat metabolism. Endocrinologists (medical doctors and biologists who study metabolism) recognize the two most common forms of diabetes mellitus as type I (insulin-dependent) and type II (non-insulin-dependent).

How does a doctor diagnose diabetes mellitus? If a patient comes to my office complaining of thirst, frequent urination, and hunger, I suspect that the patient might have diabetes mellitus. If the patient exhibits a fasting blood sugar of more than 140 milligrams per deciliter or a random blood sugar of more than 200 milligrams per deciliter and/or an elevated blood sugar after an oral glucose tolerance test, I diagnose diabetes mellitus, unless proved otherwise (e.g., metabolic variants).

The glycosylated hemoglobin (hemoglobin and glucose combined as one molecule) measurement is very important in managing diabetes. Hemoglobin is the red pigment in the red blood cell carrying oxygen to all of the

cells of the body. A normal red blood cell's life span is about 120 days. During this period, the hemoglobin molecule binds with the glucose molecule. Once this reaction occurs, the glycosylated hemoglobin remains stable during the life span of the red blood cell. Measuring the amount of glycosylated hemoglobin in the blood of a diabetic patient tells the doctor about the patient's sugar intake over the past 120 days.

## What Causes Diabetes?

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Physicians often say that they are unsure of what really causes diabetes mellitus. Knowledgeable biologists will tell you that the disease has many factors. Juvenile diabetes usually involves a family history of type I diabetes. This demonstrates a predilection toward the disease and a destruction of pancreatic insulin-producing cells (islet cells) by the person's own immune system.

Sometimes a child's antibodies turn against his or her own pancreatic cells years prior to full-blown diabetes. The presence of pancreatic autoantibodies (antibodies working against your own cells) destroys pancreatic cells. If a child's blood contains autoantibodies against the insulin-producing cells of the pancreas, this is confirmation that his or her diabetes is an autoimmune disease.

Autoantibodies are often the same antibodies that destroy various viruses such as rubella, cytomegalovirus, or mumps viruses. Sometimes, certain proteins (antigens) travel on viruses that are similar to proteins on some of our own cells. If conditions are right (or wrong, actually), immune cells begin attacking our own cells as they are killing viruses. If they attack the cells of the nervous system, a person may develop multiple sclerosis. If the immune cells

attack the kidneys, systemic lupus-associated kidney disease can develop. If the immune cells fight the islet cells of the pancreas, type I diabetes develops. More than 40 percent of children who contract rubella while in their mother's womb develop type I diabetes at some time in their life because of this process.

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*Alpha lipoic acid has also been shown  
to prevent cataracts of the lens of  
the eye.*

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Prior to any serious diabetes symptoms, 80 percent of the insulin-secreting cells (islet cells) of the pancreas need to be destroyed. Persons with fewer pancreatic cell deaths have a much milder form of diabetes. Others, with more than 80 percent destruction, have a more extreme problem. Often, the equilibrium of hormones produced in the pancreas is severely thrown off balance when insulin-secreting cells are destroyed and glucagon-secreting cells of the pancreas are left intact. Glucagon is the pancreatic hormone increasing the sugar in blood. Insulin is the pancreatic hormone that lowers the blood sugar.

People who have type I diabetes often complain of fatigue, frequent urination, thirst, and hunger. When a body's sugar threshold is reached, sugar begins spilling over into the urine. Type I diabetics often lose weight because their bodies begin breaking down proteins and fats at an in-

creased rate because sufficient sugar does not properly enter the cells.

Type II diabetes, or non-insulin-dependent diabetes mellitus, is the most common form of diabetes. Some studies report this type of diabetes is found in more than 16 percent of people over the age of sixty-five.<sup>1</sup> Type II diabetes is rare in people under forty years old but common in people over forty who are overweight. People with type II diabetes often have plenty of insulin and normal insulin production from their pancreatic islet cells, but their bodies' cells are not very sensitive to the insulin (insulin resistance). A small percentage of type II diabetics develop some pancreatic abnormality.<sup>2</sup> Sometimes these harmful changes may actually destroy insulin-producing cells, resulting in an accompanying type I form diabetes.

With type II diabetes mellitus, the classic diabetic symptoms may or may not be present, and so early type II diabetes is often difficult to diagnose. Sometimes patients have recurrent infections, frequent urination at night, visual changes, or itching. The diagnostic criteria are the same as those for diabetes type I. A good diet, an exercise program, and weight loss are essential for treatment.

## High Cholesterol and Diabetes

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High cholesterol and triglyceride blood levels are often associated with type II diabetes, and this pathology may damage the liver. Fatty livers that do not detoxify blood very well occur more frequently in diabetics than in non-diabetics. Livers of diabetics may actually enlarge because of the excessive amount of stored fat. This condition can

affect blood flow to certain parts of the liver and the pancreas, leading to serious scarring of both the pancreas and liver.

## Obesity and Diabetes

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Many scientists believe eating the wrong foods, eating too much, and becoming obese predisposes people over the age of forty to type II diabetes. Some reports state the risk of developing diabetes is tenfold in someone with morbid obesity.<sup>3</sup>

Two basic theories attempt to explain why obesity may lead to type II diabetes mellitus. In obese people, insulin has a difficult job helping the entry of glucose into the cells of the body, which results in an excess of sugar in the bloodstream. Some scientists believe overeating leads to increased insulin production, which encourages a cellular condition resulting in insulin resistance. Others think that some people, as they age, lose insulin receptors on their cell membranes and become resistant to insulin. In either case, losing weight and eating a healthy diet often reverse most cases of type II diabetes mellitus.

## Diabetic Complications

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Diabetes can cause a number of complications. A common problem, especially in diabetics who use injectable insulin, is called the Somogyi effect. This complication involves a very low blood sugar during evening hours and a high fasting blood sugar in the morning. The high blood sugar in the morning is the result of the body's attempt to normalize the low night blood sugar by secreting excess amounts of stress



hormones (epinephrine, corticosteroids) in the early morning, thus increasing blood sugar.

Because of the Somogyi effect, diabetics often have disturbing dreams during the night and wake up with painful headaches. Treatment of this problem is often successful by altering the time of insulin administration.

There are several serious chronic complications of diabetes mellitus. High blood sugar and the metabolic products of abnormal glucose metabolism (free radicals) may cause neurological, vascular, kidney, and visual problems. One of the most common complications of sustained high blood sugar is diabetic neuropathy. The basic antecedent of diabetic neuropathy is damage to the arteries that supply the nerves with blood. Often a disruption of the surrounding sheath protecting the nerve occurs, which results in complaints of paresthasias (numbness, pins and needles) and, afterward, a severe burning and pain as time goes on. Sometimes, the burning on the bottoms of feet becomes so severe that it is impossible to walk. The neuropathy frequently affects the nerves of the digestive tract. In this case, eating may become increasingly painful, and emptying of the stomach may be delayed, with an unbearable feeling of bloating after each meal.

Thickening of the membranes of the smallest blood vessels (microangiopathy) is often seen with diabetes mellitus. This condition may result in poor blood flow to an important organ. As diabetes progresses, the microangiopathies grow worse and may eventually affect the eyes and the kidneys. Diabetic changes of the retina of the eye are called diabetic retinopathies and are the result of loss of blood to the seeing tissues of the eyes. These retinopathies grow worse as the diabetic patient ages. Eventually there is blurring of vision, cataract formation, and often blindness.

In the United States, diabetes is probably the most common condition leading to serious kidney disease. The filtering units of the kidney are called glomeruli, and constant high blood sugar levels damage these functional units. Soon, proteins start leaking from the blood through the kidneys into the urine. This is often the first sign of diabetic kidney disease.

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*Some scientists believe that ALA protects against cataracts because it chelates certain metals from the eye.*

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Another complication of diabetes is macrovascular disease. This condition involves a destruction of the walls of the big (macro) blood vessels (vascular) of the body by high blood sugar levels. Blood vessel damage caused by high sugar levels may result in the replacement of normal arterial tissue with fibrous plaques. Fats, including cholesterol, are deposited into plaques. Over time, calcium deposition follows and hardens arteries (atherosclerosis).

If a diabetic patient develops changes in the arteries that feed the heart with blood (the coronary arteries), coronary artery disease is the outcome. Heart attacks (myocardial infarctions), resulting from coronary artery disease, are the leading cause of death in type II diabetics. If a diabetic patient develops atherosclerosis in the blood vessels that feed the brain, a loss of blood to the brain (stroke) may occur.

Another condition often developing in diabetics is the loss of blood to the extremities, called peripheral vascular disease. It is caused by the development of atherosclerotic plaques closing down major blood vessels to the legs and feet. In the United States, a large number of middle-aged people with diabetes develop gangrene of the feet and eventually must have their feet amputated.

Years ago, I was a member of a surgical team that amputated the leg of a diabetic patient. The patient was a personal friend who had long-standing type II diabetes and did not follow his prescribed treatment regimen. He continuously complained of cold feet. In time, after several injuries to his feet, he began developing infections of his feet's soft tissue that eventually spread to the bones. A consulting surgeon advised me that the man's feet should be amputated. I did not want to hear this diagnosis and continued to believe that we could turn this man's condition around with antibiotics and diet plans. But the man refused to follow any of our dietary suggestions. The time came for the amputations. I was stunned, during the surgery, by the condition of the patient's blood vessels that fed his feet. Most of the vessels of the lower legs were replaced by calcium, and the arteries were virtually rods of stone. The surgeon had a great deal of difficulty cutting through the concrete pillar-like arteries, actually breaking one of his surgical saws doing the job. I thus saw firsthand the devastation that high blood sugars do to blood vessels.

More than 50 percent of the nontraumatic amputations in U.S. hospitals are the result of peripheral vascular disease secondary to diabetes mellitus. About 10 percent of these people die from their condition prior to leaving the hospital. According to many doctors who treat diabetes, the five-year survival rate for patients who have had diabetic-related amputations is only about 40 percent.

Another complication of uncontrolled diabetes is the risk of infection. Injuries to the feet are often ignored because of the lack of sensation in the feet. The lack of sensation is the result of diabetic peripheral vascular disease and diabetic neuropathies. The early warning signal of pain does not occur. Once there is a break in the skin, older diabetics may not have enough of the disease-fighting components of the blood to destroy the infectious bacteria introduced as a result of the injury.

The disease-causing bacteria have a field day growing in the sugar-laden tissues of the feet. When some disease-fighting white cells of the blood finally arrive to kill the bacteria, the high sugar concentrations of the blood and the toxins produced by the infectious bacteria often poison these life-saving cells. I believe if doctors would spend more time with diabetic patients and effectively educate them about the necessity of diligently following diabetic protocols, more patients would understand and act accordingly.

## How Do Doctors Treat Diabetes?

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The conventional medical treatment for type I diabetes consists of the administration of injectable insulin and scrupulous adherence to a special diabetic diet. A type I diabetic patient with only a few functional insulin-secreting cells in the pancreas requires more injectable insulin than does a patient with more functional insulin-secreting cells.

Many doctors treating type II diabetes prescribe special diets, weight loss, exercise, and drugs termed oral hypoglycemic agents. These medications lower the blood sugar in a variety of ways. Some of them stimulate the pancreas to release additional insulin; others stretch the effects of insulin on the cell or increase insulin sensitivity.

Integrative medical doctors often suggest stricter dietary changes to control diabetes naturally. Whole foods that are high in natural fibers such as beans, unprocessed grains such as oatmeal, fruits, and certain vegetables may help control blood sugar naturally. Vegetarians who eat sensibly appear to be free from type II diabetes mellitus. Changing to a vegetarian diet appears to improve the way a cell responds to glucose in the bloodstream.

Some doctors restrict milk from their diabetic patients' diet regimens. Fewer cases of type I and type II diabetes are reported in countries with low milk consumption. Some of the proteins in cow's milk are similar to pancreatic cell proteins, and children allergic to cow's milk may develop antibodies against their own pancreas. If I had type I diabetes mellitus or any other serious autoimmune disease, I would cautiously avoid milk products.

Weight loss often reverses type II diabetes mellitus by making the body's cells more sensitive to insulin. For heavy people with insulin-dependent diabetes, losing weight can drastically reduce the amount of insulin that is necessary to control their high blood sugars. And we all know that moderate daily exercise can help reduce body fat, thus increasing insulin sensitivity in type II diabetes and lowering the insulin requirements for type I diabetes.

Many integrative medical doctors prescribe vitamins and other nutritional supplements for their diabetic patients. I usually suggest that my patients take between 400 and 800 IU of vitamin E per day. Many studies show that vitamin E reduces insulin resistance, and it can also protect the proteins of the body from glycation (sugar-induced) damage.

My diabetic patients are also on a regimen of 1,000 milligrams of vitamin C, three times a day, with meals. This water-soluble antioxidant can reduce glycation damage and

lowers sorbitol (another sugar) levels. High levels of sorbitol may damage the lens of the eye and cause cataracts in diabetics. This sugar at high levels can also damage the small functional units of the kidneys.

I also advise patients to take adequate amounts of the B vitamins because they increase glucose tolerance, prevent nerve damage, and increase glucose metabolism. A good B-complex capsule will provide sufficient amounts of pantothenic acid, thiamin, pyridoxine, biotin, and folic acid.

The regimen for most of my patients also includes coenzyme Q10 because this substance is so important for the normal metabolism of sugars. It has the added benefit of enhancing proper heart muscle function. Patients taking coenzyme Q10 appear to have lower blood sugars after they start their supplementation.

Adequate amounts of the proper minerals are essential for the diabetic patient. Many integrative doctors add low levels of chromium supplementation to their diabetic regimens because this metal seems to increase glucose tolerance. Magnesium is also prescribed because it increases insulin production in older people and appears to protect diabetics against eye damage. Zinc should be included as well since it increases immune function, which is so important in helping protect diabetic patients from infection.

Dr. Andrew Weil has an interesting perspective concerning the evolution of diabetes mellitus in humans.<sup>4</sup> He suggests that diabetes might not be an unqualified curse to certain human populations but rather a condition that some groups of people, who had to live through periods of feast or famine, developed genetically to survive. The first people with diabetes were probably better able to survive periods of starvation than their normal relatives, and diabetes only became a disadvantage in a society where food is pre-

sent in great abundance. If this concept is accurate, then diabetes is not a disease in itself. More accurately, diabetes is an alternative metabolism that becomes a disease only in relationship to the environment.

## ALA and Diabetes

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ALA can be a valuable adjunct in treating diabetes mellitus. A few years ago, I met a healthy-looking sixty-two-year-old man. He told me a very interesting story. For years, he said, he had eaten the wrong foods, did very little exercise, suffered from stress, and became overweight. He developed type II diabetes mellitus and still did not change his lifestyle. Subsequently, he developed burning feet, which gave him the excuse to avoid the little walking that he did for exercise. Before long, he started to develop neuropathies of his digestive tract—bloating, general poor digestion, and severe pain upon eating. Local doctors told him that he would only find relief if a neurosurgeon opened up his abdomen and severed the nerves to his digestive tract.

The man seriously considered this extreme surgery because his digestive pain was becoming unbearable and he was losing a great amount of weight. He discussed this situation with his daughter, a registered nurse. She advised him to delay the surgery until she searched the Internet. She subsequently found out about an investigative intravenous alpha lipoic acid program at a hospital not far from where she lived in Minnesota. The man was accepted into the program, and within three weeks the neuropathies started to disappear. Relieved of his condition, he was prescribed a good diet, nutritional supplements, and exercise. He soon

developed increased energy and felt great. His diabetic conditions have not returned.

Why is ALA effective? There are several good reasons. In the blood and tissues of diabetics, we find high levels of free radicals. Studies have demonstrated that high levels of free radicals can destroy the tissues of the eye.<sup>5</sup> High levels of low-density lipoproteins (bad cholesterol), when oxidized, precede the development of atherosclerotic vessel disease, and diabetics have much greater levels of this bad cholesterol than normal subjects.<sup>6,7</sup> This condition is greatly improved with six weeks of treatment with antioxidants. So, ALA, being an ideal antioxidant, may even prevent the oxidation of bad cholesterol.

People with diabetes mellitus have characteristically low levels of glutathione in their blood. Remember that glutathione is a very important intracellular antioxidant that forms part of an enzyme system that protect the body from changes often resulting in cancer. Alpha lipoic acid is proven to raise intracellular glutathione levels significantly.

Scientists show that serious blood vessel disease can develop when copper levels are too high in diabetics.<sup>8</sup> Some researchers believe that excess levels of copper may be another contributing factor to atherosclerotic vessel disease. Alpha lipoic acid has been demonstrated to be an excellent chelator of copper. ALA binds (chelates) with excess copper, rendering it harmless and eliminating it from the body.

Many researchers believe that ALA prevents free radical damage, a major cause of diabetic neuropathies. They also suggest that ALA can be used to treat this condition. Scientists have further shown that ALA directly neutralizes and destroys free radicals in the nervous tissue.<sup>9</sup>

Researchers also believe that ALA has a direct or indirect effect on nerve cell growth. The increased sugar levels



in the tissue of diabetic patients damage and destroy nerve fibers. ALA is reported to stimulate the sprouting of new nerve fibers on nerve cells.<sup>10</sup>

We are all aware that diabetics have high levels of sugar in their blood. Brain cells and muscle tissue suffer excessive damage when blood sugar is chronically high. ALA has also been proven to improve glucose transport from the blood into the cells. The increased amount of sugar transported into the cells generates increased brain energy availability and muscle performance.<sup>11,12</sup> When the body's cells take up the excess sugar in the blood, the mitochondria work more efficiently, glucose levels drop, and diabetes is controlled. ALA is an essential ingredient for sugar metabolism in the mitochondrion.

Alpha lipoic acid has also been shown to prevent cataracts of the lens of the eye. Because much of the environment of the eye is watery, fat-soluble antioxidants, such as vitamin E, are not as effective as ALA. Since ALA is both water-soluble and fat-soluble, it gets deep into the eye tissues and destroys the free radicals that cause the protein changes that result in cataracts. Following treatment with ALA, laboratory animals have increased levels of protective glutathione in their lenses. When animals that had been given chemicals that cause cataracts were treated with ALA, there was a 60 percent reduction in cataract incidence.

In addition to the destruction of free radicals, ALA neutralizes other chemicals that cloud the lens.<sup>13</sup> Some scientists believe that ALA protects against cataracts because it chelates certain metals from the eye.<sup>14</sup> Research points to the fact that metal intoxication may cause many diabetic complications. Other scientists report that cataracts are prevented because ALA protects mitochondrial function in the eye and increases protective glutathione activity.<sup>15</sup>

This brings to mind a series of lectures that Dr. Fred Bartter and I gave about twenty years ago on the therapeutic effects of ALA in the United States and Germany. After the lectures came a question-and-answer period. Doctors often asked whether we observed any side effects or adverse consequences to the ALA therapy. I replied that in a few patients receiving very high doses of ALA, I sometimes noticed symptoms of a transitory drop in blood sugars. I added that since we monitored the patient's blood sugar very carefully, turning up the glucose drip corrected the problem. In Germany doctors picked up on this idea, and now in Europe alpha lipoic acid is regularly prescribed for the treatment of diabetes mellitus.

## If You Have Diabetes

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People with diabetes mellitus either do not produce enough insulin or have cells that are not very sensitive to the effects of insulin. These people cannot handle glucose correctly and consequently have high blood sugar levels. High blood sugar levels may damage body tissues and produce excessive amounts of free radicals. Dietary changes, weight loss, antioxidant supplementation (including ALA), proper exercise, and in some cases oral drugs or injectable insulin may be used to control this illness and stop, or slow, the progression of the diabetes-associated damage to the tissues of the body.

The treatment of diabetes is a rather complicated business and requires knowledge of human physiology, so don't attempt to treat this disease by yourself. Find yourself a good nutritionally minded doctor who has the time to listen to you and educate you about the management of this com-

plex disease. If your doctor wants to find information about the treatment of diabetes mellitus with ALA, ask him or her to go to the National Library of Medicine Web site (Medline). Once there, your physician can type in “lipoic acid” and discover many studies describing the successful research with this amazing substance.

# Heart Attack, Stroke, and Cardiovascular Disease

## *How ALA Can Help*

**T**he wear and tear on our bodies increases each year that we age. What we used to find easy to do becomes increasingly difficult. Age and wear, compounded by neglect of physical fitness and poor eating habits, may mean an untimely death. How many times have you been surprised to learn that a friend or family member has suffered a stroke or heart attack? When this happens, we may think to ourselves how happy or healthy Uncle Charlie looked the last time we saw him and what a promising future he had ahead of him. Often the physical signs of heart disease go unnoticed as this quiet killer creeps up on a person.

You can see your doctor for your yearly physical exam and get your blood pressure checked and your heart tested during a tiring run on the treadmill. But what does this testing tell us? It may let us know that we need to get into an exercise program, discontinue smoking, and stop eating so

many delicious desserts. For the most part, a yearly exam always confirms what we already know: we are all growing older. And this is much better than the alternative. The good news is that we should be able to slow down the aging process and choose to live a longer life, in good health, and with good sense. Exercise and proper diet can extend our lives and give us better odds of living a quality life.

With our common double-bacon cheeseburger, processed food, fast-paced, high-stress lifestyles, the odds of living free of heart problems goes quickly down the tubes. What are some of the maladies we might be inviting as we age and not give good care to our bodies?

## What Is Arteriosclerosis?

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Arteriosclerosis, commonly called hardening of the arteries, is a progressive thickening and stiffening of the arteries. Most doctors know that arteriosclerosis is a normal part of the aging process and that this condition may eventually result in a weakening of the arteries and the creation of aneurysms (outpouchings of arteries).

Arteries are the vessels that carry blood from the heart's aorta (largest artery) and branch out to feed the body with life-giving oxygen, disease-fighting cells, and food. In cross-section, the artery is seen as a living, hoselike tube composed of three tissue layers. On the inside of this artery is the tunica intima. It is lined with an endothelial layer (inner layer) of flat cells that comes in contact with the flowing blood. The tunica media (middle layer) is a thick and muscular layer that can squeeze the artery and cause a pulsation. On the outside of the artery is another layer composed of connective tissue, called the adventitia.

***Atherosclerosis***

Atherosclerosis, or atherosclerotic vascular disease (ASVD), is the artery-narrowing form of arteriosclerosis that kills more people in the United States than any other disease. As ASVD progresses, heart attacks (loss of blood to the heart muscle/myocardial infarction) and strokes (loss of blood to the brain) result from this condition. During the atherosclerotic process, soft deposits of fats, including cholesterol and fibrous tissue, build up within the layers of the artery. This process is not similar to scum buildup in a household pipe—it is much more complex.

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*As you can see, historically, conventional medical therapy focuses on disorder control and daring corrections of damage, rather than on the prevention and promotion of the natural tissue regeneration processes.*

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If atherosclerosis occurs within the coronary arteries, a person is at risk of a heart attack. If the buildup occurs in the cerebral arteries, the person is at risk of a stroke. If enough blood is cut off from the heart, a weak cardiac muscle results, and the heart cannot continue pumping blood to the body. As a result, the heart cells are starved of oxygen

and food, and cardiac cell death often follows. Likewise, if enough blood is cut off from the cells of the brain, a person stops thinking, talking, hearing, smelling, secreting the necessary hormones, and carrying out the functions that are necessary for life.

### *The Mechanics of Atherosclerosis*

The deposition of fats is thought to be the earliest event in the evolution of this condition. Some doctors think this occurs when the cholesterol going into the blood vessels exceeds the processing of cholesterol by the liver and other organs. These early lesions, called fatty streaks, occur within the tunica intima.

Upon microscopic examination, fatty streaks are found to contain an accumulation of macrophages (blood cells that eat bacteria, etc.). These macrophages are found within the actual tissues of the artery and not in the “scum” clinging to the artery walls. These lesions also contain large vacuoles filled with fat, and the accumulation of these cells looks like foam (foam cells). Pathologists sometimes find these fatty streaks within the arteries of children on autopsy, and they are thought to be reversible with a lifestyle change.<sup>1</sup>

Fibrous plaque is the next stage of ASVD, usually occurring in people over thirty years old. During this stage, fatty streaks are replaced by scar tissue (fibers), and then the lesion begins to protrude into the lumen of the artery. Sometimes, these fibrous plaques become so large they may partially occlude an artery or completely cut off blood flow to a leg or other organ.

As a person ages, the fibrous plaque stage advances into a more complicated lesion. Cells die within the diseased artery wall, and more fat, fiber, and calcium build up within the lesion. Often at this stage, the lesion ruptures

into the lumen of the artery and produces hard calcium-laden ulcers. These lesions often only partially block blood flow to an organ. The lesions of ASVD usually do not cause any symptoms until there is a decrease of more than 60 percent of the blood supply to an organ, such as the heart muscle or a leg muscle. At that time, the person may complain of the pain of angina.

Angina pectoris is the chest pain a person experiences when the flow of blood to the heart muscle decreases. The pain is temporary and usually lasts only a few minutes. If the blood flow is restored, no permanent damage to the heart muscle results. Angina is brought on by a disparity between the coronary supply of blood and the heart muscle demand. A heart patient may not experience angina when at rest and calm. However, mental stress or exercise, which increases the demand for oxygen and fuel for the heart, may initiate the chest pain.

## What Causes Atherosclerosis?

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No one knows for sure what causes atherosclerosis, but one theory points at certain people who have a genetic defect within their cholesterol-processing systems. These people, when eating too much fatty food, deposit LDL cholesterol (bad cholesterol) into the middle layers of arteries, initiating plaque. This hypothesis is responsible for the multi-billion-dollar low-fat food and cholesterol-lowering drug business.

The theory may be true in certain genetically abnormal people, and it may even be true in the general population of people who abuse their bodies with too much food and a lack of proper exercise. For example, why don't



Eskimos, who eat excessive amounts of fat in their diet, develop atherosclerosis in their native environment? They do develop atherosclerosis when they move into a city, stop eating their traditional diet and begin ingesting too many processed foods, and stop exercising.

### *The Role of Cholesterol*

A tremendous amount of controversy concerns cholesterol and blood vessel disease. Most of us have heard that there are two kinds of cholesterol: the good, high-density lipoproteins (HDL) and the bad, low-density lipoproteins (LDL). Not many people know the actual role of cholesterol in the body. Why do each of us require cholesterol? Why must some people reduce their cholesterol?

The idea of ASVD fat deposition, described earlier, was once called the lipid infiltration of arteries theory. It dates back to the 1860s. Since that time, many physicians and patients have accepted the belief of high cholesterol being the causative factor in the development of heart and blood vessel disease. The relationship between cholesterol and heart disease is proving to be a more complex condition than previously thought.

Cholesterol is a type of molecule known as a steroid. It is found and used by every cell of our bodies. It is also an important constituent of the cell membrane, an insulating material for nerves, and an essential precursor molecule for the production of many hormones. While cholesterol is routinely consumed in our diets from foods such as meats, cheeses, and eggs, the liver is capable of producing its own cholesterol from saturated fats. Cholesterol is transported through blood vessels in delivery packages called lipoproteins. Low-density lipoproteins (LDL) transport dietary and

endogenous cholesterol to the various organs of the body. High-density lipoproteins (HDL) transport excess cholesterol to the liver for breakdown and elimination from the body.

Normally, the liver regulates the amount of cholesterol in the body by synthesizing and breaking down excess cholesterol. Under certain circumstances, however, the liver's cholesterol control system becomes overwhelmed and cannot function appropriately. Some factors causing this condition are an inordinate consumption of high-cholesterol-containing foods, a high intake of saturated fats causing the liver to produce a superabundance of cholesterol molecules on its own, or a problem with the cell's ability to monitor cholesterol. When any of these dysfunctions occurs, it results in more LDL than the liver and hormone-producing glands require. LDL may then become assimilated into the cells that line the damaged blood vessels and this may result in ASVD.

Most reputable scientists believe that LDL cholesterol only causes damage to the body in its oxidized state. These same doctors believe that prior to any role that oxidized cholesterol plays in ASVD, another agent, such as a microorganism, probably causes the initial damage to the inner surface of the artery.

### *The Role of Bacteria*

Some scientists feel that ASVD is a natural response to an injury to the artery. Many doctors are convinced that high blood pressure (hypertension), injurious chemicals (such as free radicals), or bacterial infections of the artery initiate atherosclerosis. A great amount of evidence supports the theory of bacterial infections causing the initial damage to

arteries. Doctors have noted for years that when patients with heart disease are put on certain antibiotics for sore throats or coughs, their angina (chest pain) disappears. This circumstance may be a clue that a chronic intra-arterial bacterial infection starts the ASVD disease process.

Some doctors recommend antibiotic treatment for all of their patients who have atherosclerotic heart disease. Patients with ASVD often have high levels of antibodies to certain bacteria in their blood. Furthermore, these bacteria can be isolated from the atherosclerotic plaques on autopsy.<sup>2</sup>

A species of the bacterium *Chlamydia* has been found to be associated with almost 80 percent of people with arterial plaque. This bacterium has also been found in the very early fatty streak.<sup>3</sup> If bacteria actually initiate ASVD, then doctors can treat many of their early-stage patients with a few cheap courses of specific antibiotics and expect to see dramatic changes.

### ***The Virus/Tumor Theory***

Another theory on the origin of atherosclerosis is the virus/tumor theory. Some scientists have found evidence of viral nucleic acids in early plaques. They think that these plaques may actually be virally incited tumors. This type of mechanism is commonly seen in the formation of several virally incited cancers. If this theory is true (and maybe it is in some cases), then some forms of ASVD may actually be just another form of slow-growing cancer.

In my opinion, ASVD is just like any other serious disease. It results from a multitude of factors including a continued injury to the arteries of the body (this may be caused by a microbe or by chemical damage) and the deposition of garbage (oxidized cholesterol, scar tissue, large amounts of calcium) into the injured wall of the artery.

## What Is a Heart Attack?

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Although most Americans are preoccupied with worry about cancer, heart disease is the leading cause of death in the Western world. According to the American Heart Association (AHA), coronary heart disease (CAD)—the condition that leads to heart attack—is responsible for nearly 50 percent of the deaths in this country and 33 percent of the deaths of people between the ages of thirty-five and sixty-five years.

Most doctors believe that some definite risk factors predispose a person to CAD and that most of these can be reversed. Severe situational stress, high blood pressure, elevated blood lipid levels, and cigarette smoking are the major risk factors. I think that even the genetic inheritance of CAD can also be lessened by modifying the expression of genes with antioxidants. So, all of these risk factors can be reversed or lessened with healthy lifestyle changes.

Coronary arteries are the blood vessels supplying the heart muscle with oxygen and food. The heart muscle cells are virtual energy factories stuffed with millions of energy-producing mitochondria. A human heart is made to operate properly twenty-four hours a day and sometimes for more than a hundred years. However, when people develop ASVD of the coronary arteries, the energy-producing mitochondria are starved of fuel and oxygen. The heart muscle then becomes ischemic (deprived of blood). If blood flow is completely obstructed to a portion of the heart, a myocardial infarction (heart attack) occurs.

The heart attack may be considered an end result of atherosclerotic disease of the heart. This event is caused by a sustained loss of blood (unrelieved ischemia) to a portion of the heart as the result of a closed artery. The prolonged ischemia leads to irreversible low oxygen tension, generation of billions of destructive free radicals, and eventually heart

muscle apoptosis (cell suicide) and necrosis (death). At autopsy, the pathologist usually finds atherosclerotic disease of the vessels leading to the heart and often sees a blood clot (thrombus) causing a complete blockage (occlusion) of the blood vessel (coronary artery).

## What Is a Stroke?

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Stroke, also known as cerebral vascular accident (CVA), is the third leading cause of death in the United States, most often striking people over sixty. Any time there is atherosclerotic blood vessel disease in the arteries leading to the brain, there is the risk of a stroke. Two types of pathology may cause CVAs. Type I is the blockage of an artery leading to the brain by a clot (ischemic stroke). Type II is the leakage of blood from a ruptured artery into the brain (hemorrhagic stroke).

CVAs produce varying degrees of damage depending on what region of the brain is damaged and how much of the brain is destroyed. A small stroke may be hardly noticeable, whereas a larger one may produce paralysis on one side of the body. A massive stroke can often bring about a coma and death.

Many strokes are caused by clots developing as a result of atherosclerosis in a blood vessel leading to the brain. As a person with ASVD grows older, the plaques begin to ulcerate into the lumen of the artery and form rough raised regions. Blood clots can form over these rough spots, break loose, and travel to the brain. The type of stroke, involving a blood clot formed in a large artery and traveling upstream to the brain, is called an embolic stroke. Other conditions such as infection, traveling air bubbles, or fat globules re-

sulting from bone fractures or other trauma may also produce an embolic stroke.

Bleeding into the tissues of the brain results in a hemorrhagic stroke. High blood pressure may exert abnormally high tensions on the arteries of the brain. If the arteries are weakened by ASVD, they could burst and blood could seep into the tissues or cavities of the brain. This seepage accumulates and may displace and compress brain tissue and cause ischemia and brain death (necrosis). After some time, if the person survives, the hemorrhage is absorbed and the macrophages (big-eater blood cells) clean up the mess, leaving large, fluid-filled spaces in the brain. If this process occurs in the brain region that contains the nerves that control speech, the person becomes aphasic (cannot speak). If this injury occurs in a brain region that contains the nerves that control walking, the person becomes paralyzed, and so on.

## What Is an Aneurysm?

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Giant aneurysms are saclike blowouts of a large blood vessel. Most occur as a result of severe ASVD in a portion of an artery. Blood may seep out of this weak area into tissues of the body, or it may be forced between the various layers of the large arteries.

Years ago, when I was a country doctor in rural New Mexico, I visited a seventy-year-old man on my rounds in the regional hospital. He had an aortic aneurysm in the lower part of his body as a result of long-standing ASVD. The aneurysm started to grow quickly while I was talking to him. We were helpless in our ability to relieve this man's predicament and his very severe pain. Within only minutes, his

blood pressure forced blood into the spaces between the tissues of his aorta and separated the various tissue layers from one another. I ordered heavy doses of narcotics to relieve his pain and something to reduce his blood pressure. A vascular surgeon was immediately called in to repair the blood vessel. The aneurysm was growing bigger by the minute. By the time the man was opened on the surgery table, the aneurysm had torn his aorta to shreds. He bled to death before our eyes, and there was nothing we could do.

## Medical Treatment for Cardiovascular Problems

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What can we do to prevent atherosclerotic blood vessel disease and the resulting heart attacks, strokes, and aneurysms? And how can ALA be used to prevent and treat these conditions?

Conventional medical therapy for blood vessel disease involves the administration of drugs and surgery. If a patient has high cholesterol levels, she is given a prescription to lower her cholesterol. If she complains of angina, she is given nitroglycerine to relax the muscles that surround the arteries and allow more blood to enter the arteries that feed the heart. If the heart muscle is weak, the patient receives a digitalis preparation or another drug to strengthen the heart muscle. If she is prone to blood clots or has developed a blockage from a clot, a blood thinner is prescribed.

Cardiologists today routinely insert a small tube into the tiny arteries leading to the heart with a balloon attached. Blowing up the balloon will often temporarily press the clot against the inner wall of the artery and open the vessel for a time. This is called balloon angioplasty.

Thoracic surgeons may even remove a healthy portion of a blood vessel from somewhere else in the body and replace the worn-out vessel with a healthy one. This is called bypass surgery. Sometimes a new healthy heart is transplanted, which creates a whole set of new problems, because the patient's body recognizes the new heart as foreign protein and very quickly begins to kill it. Transplant patients must be on powerful and very expensive immune-suppressive drugs to delay the destruction of the transplanted organ by the patient's own immune system. Unfortunately, poisoning and suppressing the patient's immune system lay the groundwork for the development of cancer.

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*Studies suggest that the supplementation of antioxidants alone may have a beneficial effect on human health by reducing the risk of heart attacks by about 20 to 30 percent.*

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As you can see, historically, conventional medical therapy focuses on disaster control and daring corrections of damage, rather than on the prevention and promotion of the natural tissue regeneration processes. In many cases, the conventional approach is the correct approach and is the only therapy that a medical doctor can realistically take, especially under emergency conditions.



### ***Vitamins and Antioxidants***

Under emergency conditions, integrative medical doctors often take the conventional approach to blood vessel disease. However, when time allows, they use diet, nutrition, exercise, and stress reduction. According to Fox and Fox in their book *Alternative Healing*,<sup>4</sup> “[N]utritional therapy is an exciting field fueled by a continual stream of new research supporting the idea that what we eat has a tremendous affect on our heart health.”

A number of vitamins, minerals, and supplements, when used with a sensible diet, can help prevent ASVD and may possibly be used to treat this condition. The body, for example, converts beta-carotene into vitamin A, and this antioxidant can help prevent the oxidation of LDL cholesterol, which leads to early ASVD.

The B vitamins also play a role in the prevention of blood vessel disease. Folic acid, along with vitamin B6 and vitamin B12 supplementation, can reduce the amount of homocysteine in the blood. Homocysteine is an amino acid that can injure the lining of the arteries and is probably an important factor in the development of ASVD.

Vitamin C supplementation may prevent blood vessel disease in a number of ways. It is essential for the maintenance of the proteins that form the healthy arterial framework, and it also lowers the levels of fats in the blood. Vitamin C has been reported to reduce the amount of chest pains in heart attack patients<sup>5</sup> and lower cholesterol levels.<sup>6</sup>

Vitamin E works in the fatty regions of the body to prevent the oxidation of LDL cholesterol, thus preventing injury to the artery wall. This vitamin may neutralize damaging free radicals that multiply in the tissues lining the arteries. It may also prevent blood clots that block vessels and lead to heart attacks and strokes.<sup>7</sup>

Proper blood levels of minerals including magnesium, calcium, and selenium are also very important in preventing blood vessel disease. These substances may help keep blood lipid levels in the normal ranges, regulate heart rhythms, prevent the oxidation of LDL cholesterol, and prevent blood from clotting. Most people probably do not get enough of these minerals in the food they eat but can easily obtain them as supplements at a health food store.

Coenzyme Q10 is one of the top-selling drugs for heart disease in the rest of the world and is sold as a supplement in the United States. Hundreds of articles have been published concerning the protective effects of coenzyme Q10 on the heart. This substance plays an essential role in mitochondrial energy metabolism, and the heart cells require enormous amounts to function efficiently.

## Free Radicals and Heart Problems

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ASVD is the leading cause of death in the Western world.<sup>8</sup> It is a disease of the major arteries that lead to the extremities, heart, and brain. The lesions of ASVD occur within the walls of the arteries and predispose a person to thrombosis (clotting), embolism (traveling clots), hemorrhage (uncontrolled bleeding), and the total destruction of arteries through the rupture and disintegration of large aneurysms. Well-established risk factors for ASVD are hyperlipidemia (high fats in the blood), hyperhomocysteinemia (high homocysteine levels in the blood), smoking, and high blood pressure. Make note that all of these risk factors result in the production of enormous amounts of free radicals, creating a condition called oxidative stress.

This oxidative stress may directly kill normal cells or interfere with cell-to-cell communications, indirectly leading

to cell death. The inflammatory characteristic of early ASVD is thought to be initiated by free radicals. Pharmaceutical companies and academic research laboratories worldwide are devoting an enormous amount of time, effort, and money to testing antioxidants (free radical scavengers) as relievers of oxidative stress. These antioxidants can thus be used as agents that prevent and treat blood vessel disease (heart attacks and strokes).

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*It has also been reported that by increasing your intake of vitamin E to a healthy level, you may significantly lower your risk of dying from heart attacks and strokes.*

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Oxidative stress results from the production of free radicals through normal and abnormal cellular processes. If the production of free radicals exceeds the antioxidant defenses of the body, free radical damage occurs to tissues and organs. Billions of free radicals are produced within the hardened artery wall, and enormous amounts of metallic ions are present in this lesion. These metals are available to catalyze various free radical reactions that result in additional free radicals and further blood vessel damage.<sup>9</sup>

The enormous amounts of free radicals in the ASVD lesion leads to oxidation and damage of LDL cholesterol carriers and other fats, various sugars, proteins, and even

the nucleic acids that make us who we are and who we will become. Damage to nucleic acids and free radicals brings about the deleterious expression of genes. So, the use of powerful antioxidants, in the correct doses, for the proper amount of time, should be able to counteract the devastating effects of ASVD. Antioxidants should also be able to reduce the amounts of LDL cholesterol oxidation and prevent serious atherosclerotic blood vessel disease (heart attacks, aneurysms, and strokes).

In the next few years, transcription factors and signal transduction (which we discussed in chapter 5) will become one of the hottest topics in biology and medicine. You will hear and see these words expressed on television and radio, in magazines and newspapers. One way free radicals affect the switching on and off of genes, and the modifying gene expression, is by activating NF kappa B transcription factor (one type of transcription factor). This transcription factor normally sits quietly in the cytoplasm of the cell but is triggered by an abundance of free radicals. When activated, NF kappa B travels to the nucleus of the cell and may bind to the DNA. This NF kappa B–DNA complex forces the cell to produce large amounts of potentially harmful chemicals, thus further increasing the severity of ASVD. Some of the injurious chemicals can cause blood clots, constrict arteries, and increase inflammation.<sup>10</sup> We now see that the activation of NF kappa B is one of the most important causal factors in the etiology of ASVD.

Studies suggest that the supplementation of antioxidants alone may have a beneficial effect on human health by reducing the risk of heart attacks by about 20 to 30 percent.<sup>11</sup> Other studies report that you can reduce the risk of strokes by eating large quantities of fresh vegetables and fruits that contain antioxidants and phytochemicals (chemicals produced by plants).<sup>12</sup> It has also been reported that by

increasing your intake of vitamin E to a healthy level, you may significantly lower your risk of dying from heart attacks and strokes.<sup>13,14</sup> Vitamin E, being fat-soluble, exerts its antioxidant effects by protecting cell membranes, protecting cholesterol from oxidative damage, and modifying platelet aggregation and adhesion to the wall of the artery (clotting).

Glutathione, discussed in detail in chapter 4, is one of the most important intracellular antioxidants. It's a tripeptide (composed of three amino acids) and capable of rendering harmless many free radicals and toxins. Scientists believe that glutathione is not only an excellent free radical scavenger but also a fixer of free radical cellular damage.<sup>15</sup>

## Alpha Lipoic Acid and Blood Vessel Disease

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How does ALA fit into this picture of a blood vessel protector and fixer? Alpha lipoic acid may regenerate (make more of) glutathione and recycle used-up vitamins E and C. By itself, without any help, it is also a scavenger of many destructive free radicals.

Diabetes mellitus is a well-known causal factor for ASVD. High blood sugar damages cellular proteins, resulting in the production of very damaging substances called advanced glycation end products (AGE). The AGE accumulates in the artery walls of diabetics and causes the adhesion of macrophages. The accumulation of macrophages and the increased production of AGE generate additional free radicals.

The accumulation of high levels of free radicals results in depletion of glutathione, the destruction of cell membranes, and nucleic acid damage. ALA interferes with the biochemical and physical damage caused by free radicals. It

recycles and generates additional glutathione. And ALA has been demonstrated to stop the adhesion of macrophages to the artery wall<sup>16</sup> and thus, theoretically and in proper doses, should be able to stop the ASVD disease process in its tracks.

Vitamins E and C also inhibit the oxidation of LDL cholesterol that, when found in excess, is laid down within the arterial wall. Alpha lipoic acid recycles vitamin E and vitamin C and thus prevents the oxidation of LDL by making these substances useful again. ALA is also a direct inhibitor of lipid peroxidation, which is the principal free radical membrane-destructive process in ASVD.<sup>17</sup>

One of the most important modes of action of ALA is its inhibitory effect on certain transcription factors. We know that NF kappa B transcription factor activation is an early step in the development of ASVD. Alpha lipoic acid has been shown to inhibit NF kappa B activation in the cells that line the arteries (endothelial cells) and thus prevent the inflammatory processes that lead to ASVD. ALA has also been shown to prohibit the travel of NF kappa B from the cytoplasm to the cell nucleus where it can cause the gene damage that results in ASVD.

Many scientists believe that ALA restores the body's natural antioxidant defense mechanisms, thus preventing a great amount of oxidative stress.<sup>18</sup> To me it seems quite sensible that careful control of your diet, sufficient exercise, situational stress reduction, the prevention of prolonged periods of high blood sugar, and dietary supplementation with antioxidants and other natural products should lower the risk of developing blood vessel diseases.

# My Prescription for Good Health

## *ALA As Part of a Whole-Life Plan*

I am often asked, "What actions should I take to remain healthy and possibly retard the aging process?" My answer is that every person is different and requires a specially tailored health maintenance program. It is important to educate yourself and to find a doctor who is well informed and will spend enough time to discuss your concerns and answer your questions. Your doctor should be committed to the prevention of disease rather than just to repairing the damage that results from the disease process.

Now that I'm older, I am trying to live a healthier lifestyle than I did when I was younger. What do I do to stay healthy?

### Diet

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First, let's discuss diet and nutrition. I try to consume at least six servings of fresh fruits and vegetables each day. I try to

obtain the remainder of my calories from whole grains and a modest amount of lean meat or dairy products. I use fats, oils, and sweets sparingly.

To start the day, I eat a bowl of oatmeal topped with fruit and drink an eight-ounce glass of pure water. Normally, I have a large lunch. Most of the people around the world take a long, restful, and stress-free lunch period so that they can recharge their batteries. Although many of us can't do this, we can still eat well. My lunches usually consist of vegetable soup, a slice of whole-grain bread, and some fruit, such as an orange or apple, for dessert.

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*Your doctor should be committed to  
the prevention of disease rather than  
just to repairing the damage that re-  
sults from the disease process.*

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My evening meal is smaller than lunch. I often eat a three-ounce slice of free-range chicken or turkey with large servings of vegetables rich in antioxidants such as broccoli, cabbage, cauliflower, carrots, or sweet potatoes. Often I add a slice of whole-grain bread and a green salad to dinner. For a snack, a container of yogurt or fresh fruits or vegetables do the trick. I never eat snacks prior to bedtime because of gastroesophageal reflux that often occurs when one lies down after a meal.

I often add individual fungal foods to my meals. Fungi are not related to plants but are close relatives of ani-



mals, particularly protozoans. I particularly like shiitake mushrooms because of their oaky flavor and because certain chemicals that are found in shiitake have been demonstrated to stimulate the immune system to kill cancer cells. I don't eat too many commercial white or button mushrooms because they are usually grown on fecal material and often contain large amounts of pesticide residues that cannot be easily removed by washing the surfaces of these fungi.

Soy foods are another way to add variety to your diet. I enjoy eating tofu, which is readily available and can be prepared in countless ways. I like the texture of tofu and the way it tastes. If you don't, you may want to experiment with tempeh, another type of soy food that is chewy in texture and a very satisfying, healthy alternative to meat products. These soy products are fermented by fungi and contain large amounts of valuable proteins and isoflavones, the complex plant chemicals that protect us from certain forms of hormone-induced cancers.

Specific spices and flavorings such as turmeric, ginger, and garlic are included in my diet because I like the taste and research has demonstrated that these foods discourage the development of numerous diseases. Recently, I read a research article that reported that garlic extract stopped the growth of leukemia cells.

I try never to eat when I am stressed out. It is better to miss a meal than develop indigestion. Also, I only eat while sitting down. I concentrate on eating rather than carrying on a conversation or reading a newspaper. Eat slowly and calmly. Sometimes when I'm on a trip, it is necessary to discuss business over dinner. Under that condition, I have difficulty concentrating on eating so I just order a small salad and don't feel that I have to finish a large meal that I can't enjoy.

## Supplements

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What vitamins and supplements do I take every day? Some people take large amounts of supplements, but I don't believe that approach is necessary unless the dosages are taken for a specified length of time to counteract a specific ailment. I know that we are constantly bombarded with toxic insults to our body, but the disproportionate ingestion of too many antioxidants can throw our electrochemical systems out of balance and actually promote rather than prevent disease conditions.

Every morning with breakfast, I take several capsules of vitamins and other supplements with an eight-ounce glass of water, including 1,000 milligrams of vitamin C. This antioxidant can neutralize the water-soluble free radical toxins. I also include a good multivitamin and mineral formula without iron. Iron in excessive amounts can promote several chemical reactions that can result in free radical production and cell membrane destruction. These harmful chemical reactions can increase the risks of heart disease and cancer. Most men and postmenopausal women do not require supplementation with iron, but adolescent girls and women of child-bearing age might want to take a supplement to meet the 18-milligram Recommended Daily Allowance.

I also take 25,000 IU of beta-carotene and a 50-milligram capsule of coenzyme Q10. Several studies have shown that Co Q10 is therapeutic for the heart and may even help heal a diseased heart. It has also been demonstrated to prevent certain forms of cancer, especially breast cancer. Carotenes in the correct dosages can block viral disease and protect the skin. I also add 100 milligrams of ALA and a good B-complex capsule. Alpha lipoic acid is a great antioxidant and recycles vitamin C, vitamin E, and glu-

tathione. The B vitamins, among other actions, give an extra boost to the alpha lipoic acid.

I don't take vitamins and supplements at lunch, but I repeat the morning regimen with the evening meal. I obtain some vitamin E in the multivitamin, but I also supplement that with enough so that I get 600 IU each day. Vitamin E can neutralize the free radicals that are found in fatty tissues. (Be aware that too much vitamin E, more than 1,000 milligrams per day, may actually be harmful.) I also make sure that I get at least 200 micrograms and not more than 600 micrograms of selenium each day because it has been demonstrated to be a coenzyme in at least three detoxifying reactions and is important for thyroid function.

## Exercise

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Proper exercise is essential. I had a regular exercise routine when I was a teenager and never was ill. Then I started working very long hours, stopped exercising, and ignored the rules for good health in my late forties; soon I started feeling sick and devoid of energy for the first time in my life. I am now on a regular exercise regimen again, and I feel great.

I believe each person requires a specially tailored exercise program. I train at a gym three times a week, but I don't overwork because exercise must be fun, or it may become unhealthy competition and produce unwanted stress. Depending on how I feel, at each session I run or walk ten to twenty minutes on the treadmill. Then I do some resistance training with weights. When I was in my twenties, I used very heavy weights, but now I use what is comfortable. After the weight routine, I do sit-ups and stretching exercises. The

gym seems to stimulate my body's pharmacy to inject some wonderful chemicals into my bloodstream. Each night I also take a forty-five-minute walk with my dog.

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*A good rule for sleep is getting to bed relatively early so you have time to fall asleep naturally.*

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It is well accepted that moderate exercise just three times a week will boost the immune system function and reduce the stress of a hard day. People who regularly exercise have fewer heart attacks, less cancer, fewer infections, and just feel better. But let me add again, if exercise is not enjoyable and becomes stressful, it will not be beneficial. If exercise becomes a source of stress, it makes just as much sense to sit on the couch and watch television.

## Bowel Health

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Another important subject that sometimes is forgotten is bowel health. I know people who don't move their bowels for a week. This is very unhealthy as toxins that build up in the digestive tract are reabsorbed. As a result, free radicals are propagated in the tissues, which can result in headaches, muscle pains, fatigue, and problems with immune function. It is very important to have a daily bowel movement, prefer-

ably at the same time in the morning every day. I recommend eating large amounts of fiber-containing vegetables and fruits to avoid constipation. Drinking at least eight glasses of water each day is essential, and you may wish to supplement your diet with flaxseed meal. Flaxseed meal is a remarkable food. It contains large amounts of fiber and omega-3 oils, which, among other benefits, promote good heart health. Flaxseed meal tastes good—I put a tablespoon of it over my yogurt or sprinkle some on salads.

## Stress Relief and Getting a Good Night's Sleep

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In our fast-moving world, most people have stress-filled lives and may actually create their own stress by accepting unrealistic deadlines and working too much. We must learn to slow down and make our lives less complicated to reduce stress. I spend at least thirty minutes each day in sitting meditation. I try to be mindful of the moment rather than worrying about what I am supposed to do in the next hour or next week. It is very helpful to evaluate each circumstance that happens as simple stimulus. Giving each situation a designation of pleasant, unpleasant, or neutral can help defuse the emotional impact of an occurrence and allow you to move on with your day.

A good sleep of seven or eight hours each night is necessary for good health because it is during sleep that your immune system and brain recharges. People who do not get enough sleep cannot effectively fight stress- and disease-producing organisms. Our ancestors fell asleep soon after dark and woke up when the sun appeared. There were very few distractions at night a hundred years ago. Today, we are

all tempted to turn on the television, listen to the radio, or sit by the computer.

A good rule for sleep is getting to bed relatively early so you have time to fall asleep naturally. Do something relaxing first, and tell yourself that the bed is for sleeping, not worrying. Reading an interesting book is an effective way to turn off mental noise. Today, in our troubled world, it is very difficult to keep from thinking about unpleasant situations. When an unpleasant thought occurs, I often use imagery to eliminate it. In my mind I enclose the thought in plastic wrap and attach a huge helium balloon to it. Then I watch it float away, up into the stratosphere until it is out of sight.

Many situations besides anxiety and apprehension interfere with sleep. Bright lights may surround us, causing a type of light pollution that interferes with falling asleep. We sleep best in a completely dark room. Some people eat snacks prior to going to bed, but this behavior can be dangerous. If you go to sleep just after eating, large amounts of acid accumulate in your stomach. Anger or anxiety may lead to the overproduction of more acid and induce contractions of your stomach. When your stomach is full of food and acid, stomach contractions can force food up your esophagus and into your mouth and throat, and may be aspirated and lead to chronic coughs, pneumonia, and asthma. This condition is endemic today.

It is also not wise to drink coffee prior to bedtime. Caffeine is a stimulatory substance that can hinder good sleep for several hours. And make sure that your bedroom is conducive to sleep. It should be clean, quiet, and completely comfortable. If all else fails, I have found that small doses of valerian root capsules or a cup of chamomile tea before bedtime can be restful. You must be careful, though: some people are allergic to the chamomile plant, and valerian root can at times have a contradictory effect and keep you awake.

I take very small doses of melatonin (1 milligram) at night, when I remember, about an hour prior to bedtime. This hormone is naturally synthesized in the pineal gland of the brain and has been shown experimentally to regulate sleep cycles. When we are young, our brains produce a lot of it at night, but as we age, the pineal gland slows down and often calcifies. An old calcified pineal gland produces very little melatonin. Melatonin is a hormone and should not be taken by young people because they produce plenty of it. This hormone is also an immune stimulator, so someone with autoimmune disease such as multiple sclerosis or systemic lupus should not use it.

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*Enjoy yourself, and be mindful of each minute that you are here. If you live this way, your brain will produce chemicals that will keep you physically and emotionally healthy.*

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I believe that if you follow a healthy diet, obtain the proper nutrients, drink enough water, reduce stress in your life, and regularly get a good night's sleep, you will be on the road to good health. But can you be healthy and not follow these rules?

My father died last year at the age of ninety-one. He worked very long hours as a bartender in a Near North Side bar in Chicago for sixty years. He slept very few hours, was

exposed to constant secondhand smoke, imbibed several alcoholic drinks each night, worked too hard, and ate all of the wrong foods at the wrong time of day. One night, a few years ago, while visiting his apartment, I heard noises in the kitchen at 3 a.m. I awoke and found him at the kitchen table eating a gigantic spicy and fatty pastrami sandwich, big salty pickles, a full bag of potato chips, and a large bottle of soft drink. I asked why was he eating such a large meal in the middle of the night. He answered that this is what he did almost every night. He would lie in bed and get hungry. He said that he would then go to the kitchen and eat and fall peacefully back to sleep.

I told him that I could never eat such a huge meal at this time of night. He told me that was because I was spending too much time studying, reading, and thinking about the unimportant things that make people nervous and anxious. He said that he enjoyed every day of his life and that he did not take things very seriously. If something stressful popped into his mind, he would let go of it. And because of this he could immediately fall asleep at any time of the day or night or eat anything he wanted at any time. He did not understand the mechanics of psychoneuroimmunology, but he lived it. I believe that he had the correct idea: if your mind is in the right place, you will have a much greater ability to fight disease and you will age more slowly. Maybe having your mind in the right place is the most important promoter of health, but don't forget the significance of leading a healthy lifestyle, too.

### **Don't Forget to Enjoy Life!**

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Fostering close relationships with your friends and/or family is very important. Numerous studies have demonstrated



that those who have good personal relationships are healthier and live longer lives than people who are insular. And it is very important to have fun each day. Get some good laughs. Play a game or sport often. Develop a healthy sex life. Eat a decadent meal once in a while without guilt. Enjoy yourself, and be mindful of each minute that you are here. If you live this way, your brain will produce chemicals that will keep you physically and emotionally healthy.

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## Afterword

**D**espite the historic lack of interest in marketing ALA, there is currently an increase of activity to bring it to market as an intravenous prescription drug. In Europe, ALA is already a prescription drug used to treat all types and stages of liver diseases. In the United States, with the exception of my own work, not much research has been done on it until recently.

Several ALA research programs are being carried out at a number of well-respected research centers today. I personally am involved with two studies on the effects of high doses of ALA on the various organelles and the biochemistry of the cell. I am also preparing scientific reports on the many cases of acute liver disease that I have treated with this substance.

Do you want to see ALA approved as an intravenous prescription drug in the United States? On the one hand, that would be a good move. Doctors could conveniently use the drug for numerous cases of severe liver disease, the reversal of the free radical damage of heart attacks and strokes, and other conditions. Research programs in Europe and Asia are reporting high levels of success with these applications.

On the other hand, if one form of ALA were approved as a prescription drug, I would hope that would not mean alpha lipoic acid supplements would be taken off the shelves of health food stores. If that were true, people would lose the ability to choose for themselves and easily purchase this most effective antioxidant.

I have practiced medicine for more than twenty years, and each year insurance companies, the government, and the public subject the medical profession to new controls and restraints. When I started to practice medicine, I was proud to be a doctor because I believed physicians helped most people. Today, I am not proud of the profession. In most cases, conventional medical care is just a business in which the treatment of the patient appears to be subordinate to writing down the correct codes on an insurance form. In most cases the doctor-patient relationship has ended, and accountants, managers, and secretaries dictate the way a person practices medicine. Doctors are called “providers” and “gatekeepers” and are not always allowed the autonomy to help their patients in the manner they feel is most beneficial.

Recently, in an attempt to provide more autonomy for myself and my patients, I opened a private integrative medical practice in Las Cruces, New Mexico. I spend as much time with each patient as he or she needs, and I combine efficacious conventional therapies with scientifically proven nutritional and mind-body treatments. I have many patients on balanced nutritional programs combined with exercise and meditation. I enjoy this mode of practicing medicine, and I believe that my patients are satisfied with the programs.

I hope you, too, will find a way to activate autonomy in your health care decisions. Research, learn, and ask questions—it’s your health, and you deserve the best care available. I suggest that the next time you require medical care to find a doctor who practices integrative medicine. A good

integrative medical doctor will have the knowledge to combine effective natural approaches with conventional medical practices. Your doctor needs to form a healing partnership with you and provide extensive information on the various therapies available for your treatment. Then, and only then, can the informed patient make a decision and select the best possible therapy obtainable.

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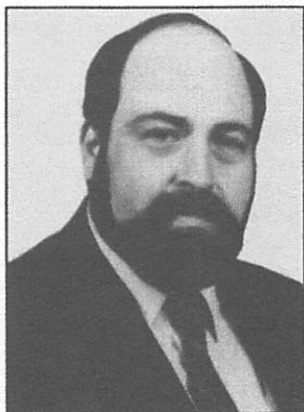
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## About the Author

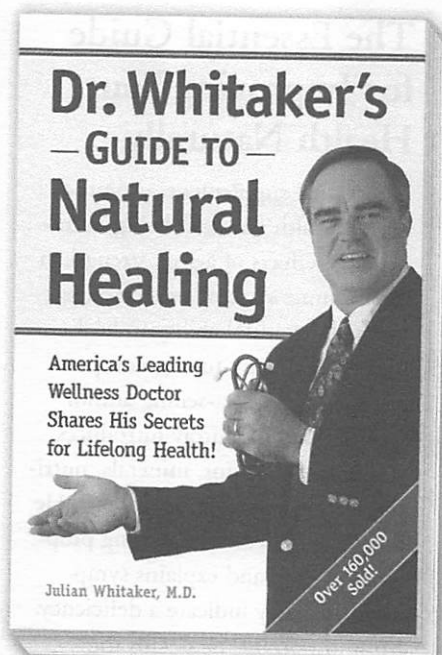
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Dr. Burt Berkson has a Ph.D. in biology as well as an M.D. He was a professor at Rutgers University and Chicago State University. In addition he held research positions at the Max Planck Institute for Biological Sciences in Heidelberg, Germany (toxicology), the University of Illinois (National Science Foundation), and the Cleveland Museum of Natural History (mycology and microbiology). The FDA appointed him principal investigator for intravenous lipoic acid in the United States. He is the only doctor to have used lipoic acid in the life-saving treatment in patients suffering acute liver failure. He continues to do research and operates a private practice in Las Cruces, New Mexico.



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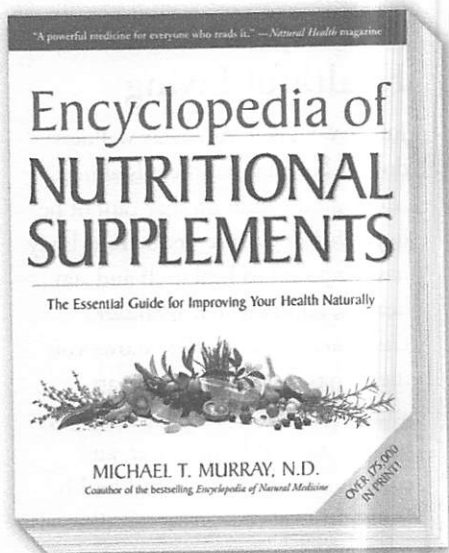


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