



E n e r g y,
STRESS,
AND YOUR HEALTH

People are experiencing burnout like never before. It's easy to see why. Between cell phones, pagers, and instant messaging—not to mention job demands, family responsibilities, and a nonstop flow of obligations and commitments—we're on call 24/7. No matter how many tasks we cross off our to-do lists, they just keep getting longer. Then we must deal with the threats of terrorism; snipers; and SARS, West Nile virus, and other newly minted infectious diseases, which only fuel our anxiety levels. Just thinking about it all makes us toss and turn well into the night, compromising the sleep we so desperately need to replenish our dwindling energy reserves. We yawn and stumble through our days, feeling simultaneously tired and wired.

Does this sound familiar? If so, you may be one of the millions of Americans who chronically expend more energy than they have, someone whose energy reserves are almost always tapped out. This imbalance puts an enormous amount of stress on body and mind. It also is a leading cause of illness in the United States, where an estimated 80 percent of health problems stem from stress.



To get a clearer picture of how stress—or overspending your energy reserves—affects your health, imagine your body as a car battery that constantly uses energy without ever fully recharging. In other words, more energy is expended than replaced, so less and less juice is available over time. Eventually, the battery wears down, and the engine won't turn over.

We humans are similar. Everything we do, mentally as well as physically—from eating breakfast to planning the day's agenda to falling in love—burns energy. For this reason, we require a steady supply of energy in order to function well. These days, with so many pressures bearing down on us, our energy demands are greater than ever. And we need to store extra energy for use during unexpected crises.

We must replenish our energy reserves daily—ideally with more than we expend so that we always have an ample supply available for those times when we really need it. This may be what *Rhodiola rosea* does best.

RHODIOLA ROSEA: NATURE'S PERFECT ENERGIZER

Rhodiola rosea is one of those rare substances that increase energy at the very source: our cells. For several decades, researchers have been examining the root of this remarkable herb, which grows wild at high altitudes in Siberia and other northern regions. Their conclusion? *Rhodiola rosea* actually boosts energy production in the cells of the major organ systems.

This power surge at the cellular level not only helps us manage stress with greater ease but also protects against disease and neutralizes environmental toxins. A growing body of evidence shows that *Rhodiola rosea* significantly improves physical and mental function,



as well as the workings of the cardiovascular, immune, and neuroendocrine systems. (The term *neuroendocrine* collectively refers to the neurological and endocrine systems. It's a product of current research that shows just how intimately connected these systems are.)

Our own positive clinical experience with the herb—as well as our colleagues'—is consistent with the research. We have found *Rhodiola rosea* to be extremely beneficial in treating depression, anxiety, chronic fatigue, neurological disorders, sexual dysfunction, and hormonal imbalances. It also has helped many of our patients successfully manage debilitating conditions such as cancer and Parkinson's disease—with few or, in most cases, no bothersome side effects.

We cannot emphasize the last point enough. By the time they seek our counsel, many of our patients are at their wits' end. Some already have consulted numerous specialists and tried multiple prescription medications—either to no avail or with intolerable side effects. Others have gone the natural route, experimenting with ginseng and other herbs to improve their mood or enhance their energy.

In fact, the number one reason most of our patients say they buy supplements is to boost flagging energy. Yet the majority of herbs and nutrients touted for their energy-enhancing properties actually offer little benefit or cause unpleasant side effects.

But *Rhodiola rosea* is different.

By now you may be wondering, How can one herb do so much? And if it really is so special, why haven't you gotten wind of it before now? The answer—which we'll discuss in much greater detail in chapter 4—is part folktale, part Cold War thriller. For centuries, *Rhodiola rosea* has been prized by those who live in the regions where it grows. It wasn't systematically studied by scientists until the latter half of the 20th century. And many of the results of those investigations were kept top secret until recently.

In part 2, we will present convincing scientific proof of how



Rhodiola rosea—which thrives in unforgiving subarctic terrain—can dramatically improve nearly every aspect of our physical and mental well-being. But because this resilient herb directly increases energy in cells, we first must explore the key role of energy in our overall health.

WE ARE ENERGY

We tend to think of our bodies as solid structures—consisting of bone, muscle, organs, and a network of arteries and veins through which our blood circulates. In reality, we could condense the solid matter in the human body to the size of a thimble. The rest is space—space within cells, space between cells, space between organs. Connecting and enlivening all these parts is the energy that our cells produce. It's what keeps us going. Without an adequate energy supply, our health suffers.

The ancient Chinese healers who devised acupuncture, a healing discipline that acts directly on the body's energy centers, recognized this thousands of years ago. So did the ancient Indian scientists and spiritual teachers who created yoga techniques to elevate *prana*, the Vedic word for life force. They understood that energy is our most precious human resource. But just like the energy that heats our homes and fuels our automobiles, the energy in our bodies is finite. Our challenge is to learn to use it wisely while doing everything we can to make sure we don't run low.

Continually tapping our energy supply without replenishing it can lead to an imbalance that has a negative effect on our health and well-being. Until we learn to maintain balance between how much energy we burn and how much we store, we may be doing the best we can, but we won't be doing—or feeling—our best.



TWO TALES OF ENERGY IMBALANCE

Many patients who seek our help struggle to handle the multiple stresses in their lives. They have trouble just getting through the day, fulfilling their obligations, let alone experiencing moments of peace and joy. Although some show symptoms of depression, a surprising number cite low energy as their chief complaint. Without knowing anything about the science of energy, many describe themselves as feeling depleted or “running on empty.” Sam and Nancy are perfect examples.

If it’s Tuesday, it must be Bombay. Sam traveled so much he seldom knew where he was or what time of day it was until he opened the drapes in his hotel room. Still, he had been organizing public events for so many years that he somehow managed to pull himself together after 4 hours of sleep, then entertain an audience of 5,000 as if on autopilot. He even breezed through hours of organizational meetings in touchy political environments and situations laden with cultural sensitivities. But after 12 years of crisscrossing time zones, Sam—renowned for his incredible stamina—realized that he was running out of steam.

Sam and Dick had known each other for years. When they met by chance at a conference in Germany, Dick immediately noticed the strain in Sam’s face. In the few minutes they spent together, Sam asked if Dick could help him overcome the mental and physical fatigue that was becoming his constant companion as he circled the globe.

Fortunately, Dick had a spare bottle of *Rhodiola rosea* in his backpack. He handed the bottle to Sam, who was rushing to catch a ride to the airport en route to his next destination. Two weeks later, Sam sent an e-mail of thanks praising his newfound energy booster.

Like Sam, Nancy was so accustomed to pushing herself that she didn’t realize just how depleted her energy stores were. And at age 45,



she was too busy and revved up to pay much attention to the changes that were taking place in her body and brain. Although she had started working part-time when her first child turned 2, after her second pregnancy, she decided to leave her job and become a stay-at-home mom. Before she knew it, Nancy was caught up in the whirlwind of raising three children. Her days were packed with the usual school functions, carpooling, and homework support, plus household chores and volunteer activities.

As her kids became more independent, Nancy decided to return to the classroom herself, to pursue a graduate degree in computer science. She signed up for two classes at a nearby state university. That's when it hit her: She was in a program with 24-year-olds who had been playing with computers since they were toddlers. Their minds processed information faster than hers. Nancy needed to spend so many extra hours on homework that she was staying up later and later. Soon she was forgetting things and losing things—signs that she was expending far more energy than she was replenishing. The demands were just too great, and the strain of keeping up with family responsibilities as well as schoolwork left her stressed and exhausted.

But Nancy was no quitter. She gave up her few leisure activities to devote more time to her studies. Then one day she felt her heart skip a few beats. Nancy's doctor explained that a combination of stress, weight gain, and lack of exercise—all by-products of her hectic lifestyle—was causing her irregular heartbeat. This served as Nancy's wake-up call. She realized that by not paying attention to her health, she had increased her risk of developing heart disease, diabetes, and cancer. She took this as a challenge, declaring to her family, "I'm not going to die prematurely from one of those age-related diseases!"

Nancy enrolled in a medically supervised weight-loss program. Every time she dropped another 5 pounds or walked an extra mile, she celebrated. But even though her weight was nearing a normal



range, she still was having problems with low energy, mental sluggishness, and forgetfulness. That's when she got in touch with Pat, who recommended *Rhodiola rosea*—100 milligrams twice a day.

A week later, Nancy called, wondering if the herb could work in just 7 days or if she was experiencing a “placebo response.” She reported that her mind was sharper and that her memory was improving. Best of all, she had enough energy to carry her through the day and still enjoy the company of her husband and children in the evening. And because of all she had done to restore her health, her heart no longer skipped a beat.

For both Sam and Nancy, *Rhodiola rosea* was one of the keys to overcoming stress and fatigue. But as Nancy learned, we also must make dietary and lifestyle choices that allow our bodies to recharge and heal.

When we spend down our energy reserves without replenishing them, we shortchange ourselves. We not only fall short of our potential, but we endanger our health as well. *Rhodiola rosea* can help replenish vital energy so we are able to make the necessary adjustments to live full, balanced lives.

CELLS: THE BODY'S POWER PLANTS

Since every action, thought, and emotion—and especially stress—uses energy, you may be wondering exactly where all that energy comes from. Each cell produces its own energy supply via the mitochondria, microscopic structures that convert nutrients from food into energy. The cells store their energy in molecules called ATP (adenosine triphosphate) and CP (creatine phosphate), which transport and release energy as necessary. If our bodies were cars, ATP



and CP would be the fuel in those huge storage tanks that stand near refineries, in the trucks that fill the underground tanks at the local filling station—and in the hose that runs from the gas pump to the car.

The instructions for producing ATP and CP are encoded in our DNA. When the mitochondria generate ample quantities of these molecules, the cells have an abundance of energy and are capable of fueling all the biological activities necessary to function optimally. But if for some reason the mitochondria can't keep up with the cells' energy demands, we're at risk for a cellular energy crisis.

Researchers have identified several factors that can impair mitochondria, thereby diminishing energy production. Among them is hypoxia, a condition in which cells don't get enough oxygen to metabolize glucose and produce ATP and CP. Hypoxia can occur at high altitudes or can result from a reduced blood supply due to atherosclerosis (hardening of the arteries), heart or lung disease, stroke, head injury, massive bleeding, or smoking. Actually, anything that inhibits the oxygen-carrying capacity of red blood cells can set the stage for hypoxia. Incidentally, *Rhodiola rosea* helps protect against hypoxic damage and has been used to prevent altitude sickness.

Another factor that can compromise the energy-producing ability of mitochondria is injury to DNA and cellular membranes. Oxygen free radicals are notorious for wreaking havoc on our bodies. But in fact these unstable molecules have the potential to do good or evil—helping to destroy infectious viruses and bacteria, or assaulting essential cellular components. The phrases *oxidative stress* and *oxidative damage* refer to the harm inflicted by oxygen free radicals on DNA and cell walls, as well as on proteins. As this damage accumulates, a cell's capacity to generate energy declines. This is considered to be a major contributor to cell death, tissue damage, and aging and age-related degenerative diseases.



Because brain cells run at a very high metabolic rate—making them the gas guzzlers of the body’s energy consumers—they are especially vulnerable to oxidative damage and energy crises. When they don’t have enough energy in the tank to keep running smoothly, it leads to a loss of neurons, or nerve cells. This, in turn, can accelerate brain aging and the onset of degenerative diseases such as Alzheimer’s and Parkinson’s.⁷

On the bright side, recent studies suggest that we can improve energy efficiency, reduce oxidative damage, and safeguard cells in the brain and central nervous system. The key is to increase our intakes of antioxidants and adaptogens such as *Rhodiola rosea*, along with making healthy changes in our diets.⁴ *Rhodiola rosea* boosts energy production and defends against oxidative damage. These actions are especially beneficial in improving mental performance and preventing the deterioration of nerve cells.

THE STRESS - ENERGY EQUATION

Stress occurs whenever our activity levels exceeds our energy levels, or whenever we perceive a threat to our well-being. Ever since Hans Selye’s pioneering studies in the 1930s, we’ve learned a great deal about stress and about the harmful effects of stress hormones on every major organ and system in the body.

Unfortunately, we haven’t learned nearly as much about energy. This is because in the past researchers focused exclusively on the stress response system, without examining its impact on the energy supply. More recent investigations have shown that the stress response system regulates the body’s production, delivery, and utilization of energy. And because the stress response system itself runs on energy, it, too, can fall victim to chronic energy depletion.



The two main components of the stress response system are the sympathetic branch of the autonomic nervous system and the hypothalamic-pituitary-adrenal (HPA) axis. The autonomic nervous system regulates the body's involuntary functions, including heart rate, blood pressure, the dilation and constriction of blood vessels, respiration, digestion, and the activity of smooth muscles. The two parts of the autonomic nervous system, known as the sympathetic branch and parasympathetic branch, balance each other. For example, the sympathetic branch is responsible for the release of epinephrine (adrenaline) and norepinephrine, hormones that accelerate heart rate and respiration. The parasympathetic branch has the opposite effect, slowing heart rate and respiration.

The hypothalamic-pituitary-adrenal axis regulates the manufacture and release from the adrenal gland of hormones called glucocorticoids. Among them is cortisol, which influences many aspects of homeostasis—the state of equilibrium—throughout the body, including the storage and release of fuel, suppression of the immune system, and reproduction. The sympathetic nervous system and the HPA axis use many neuroendocrine pathways to communicate and coordinate their activities.

Selye found that whenever we're subjected to excessive physical or emotional stress, the sympathetic nervous system can trigger the body's fight-or-flight response, a complex chemical reaction that helps us to handle threatening situations.⁵ This remarkable "survival instinct" kicks in with the rapid release of epinephrine, norepinephrine, and cortisol—the stress hormones mentioned earlier. They stimulate our brains to be more alert while pumping more blood into our muscles and delivering the extra energy necessary to survive the immediate danger. (Actually, epinephrine and norepinephrine qualify as *neurohormones*. In other words, they act as both hormones and



neurotransmitters, chemicals that enable nerve cells to communicate with each other.)

The elegantly designed stress response system is meant to be activated for relatively short periods of time, followed by longer intervals of recovery and healing. But when the crunch is ongoing and our bodies must endure prolonged high levels of stress, the epinephrine, norepinephrine, and cortisol keep on pumping. In effect, the stress hormones that are essential for our short-term survival keep our bodies running on overdrive without allowing our cells to fully replenish their energy reserves or make critical repairs.

Until quite recently, doctors and scientists believed that all we needed to do to break the stress spiral is calm the sympathetic nervous system, primarily by avoiding overexposure to stressful situations. According to the latest research, this is only half of the equation. As chapter 2 explains, the imbalance in the autonomic nervous system involves both overactivation of the sympathetic nervous system and underactivation of the parasympathetic nervous system. It is the parasympathetic branch of the autonomic nervous system that is responsible for healing and for replenishing our body's energy reserves. In order for it to do its job, we need regular intervals of recovery, during which the stress response system is not operating at warp speed.

HOW THE STRESS RESPONSE SYSTEM REGULATES ENERGY

When the stress response system switches on, the body is preparing for an emergency. Just as a race car at the starting line uses more fuel when the driver revs the engine, our bodies burn more energy when



we're getting ready to fight or flee. Our brain cells are activated for increased alertness and attention to danger, so they consume more energy. So do our hearts as they beat harder, our lungs as they pump faster, and our muscles as they contract.

The body stores fuel in the form of fatty acids and glucose, a simple sugar. To meet increased energy demands during times of stress, the stress hormones mobilize energy stores by stepping up several processes, including lipolysis (the release of fatty acids into the bloodstream as triglycerides), glycogenolysis (the release of glucose into the bloodstream), and protein catabolism (the breakdown of proteins). Then the stress hormones accelerate the delivery of these raw materials by elevating heart rate, which in turn increases bloodflow to critical areas, such as the brain and muscles.

Of course, with this higher rate of consumption, energy reserves won't last very long. But once we escape from or overcome a stressor, feedback mechanisms such as cortisol switch off the stress response system, allowing the body to replenish its energy supply. Still, if the state of emergency lasts for too long, it can set the stage for an energy crisis.

ENERGY DEPLETION AND FREE RADICAL DAMAGE

Simply put, constant activation of the stress response system can deplete the body's energy supply beyond its capacity to refuel. When individual cells do not have enough energy to maintain their vital functions, different parts of the system may become fatigued, strained, and eventually damaged. This may manifest itself as chest pain or heart attack, high blood pressure, stomach irritation or ulcer,



reduced immunity, or another health problem, depending on individual vulnerabilities.

In addition, when cells metabolize nutrients—which is what occurs chemically when we burn energy—they also generate by-products, including oxygen free radicals. An oxygen free radical is the molecular form of oxygen, minus a crucial electron. We're constantly burning energy and releasing oxygen free radicals, even when we eat, or talk on the telephone, or go for a walk.

Oxygen free radicals are part and parcel of being alive. But when we're under chronic or recurrent stress, we burn more energy and produce even more oxygen free radicals than usual. If the concentration of these molecules exceeds the body's capacity to neutralize them, they begin to harm cells and—in cases of chronic stress—our tissues and organs, including our brains. Oxygen free radicals also damage mitochondria, the cellular components that produce energy, thereby reducing our capacity to maintain cellular energy levels.

The overproduction of oxygen free radicals could be compared to the dumping of chemical waste. When waste products accumulate faster than the environment can detoxify them, plant and animal life suffer.

HOW DO WE AVOID AN ENERGY CRISIS?

Think of the parasympathetic nervous system as the Environmental Protection Agency of the body. Just as mandatory speed limits conserve fuel, the parasympathetic system reduces energy expenditure by slowing the heart and respiratory rates and calming the brain. This enables cells to slow their energy production and reduce the release



of oxygen free radicals. Then the cellular defenses have a chance to neutralize any existing free radicals and repair any damage before it becomes so severe that the cells lose their capacity to produce energy and end up being destroyed.

This means that if we don't train ourselves to slow down and take time to recharge—even when the stress in our lives is positive, as with the birth of a child or a promotion at work—our energy reserves stay chronically low and we're constantly battling burnout. Even the word *burnout* is on the mark because during times of severe or chronic stress, the stress response system literally *burns* extra energy. If we remain in this state long enough without shoring up our energy supplies, our bodies become vulnerable to disease and premature aging.

The good news is, we can easily replenish the energy we use when we're under stress. How? By balancing periods of intense mental and physical activity with periods of rest; by maintaining a healthy lifestyle; and by boosting our energy reserves with *Rhodiola rosea* and other natural energizers.

TOO MUCH STRESS, TOO LITTLE ENERGY

Before we can stop the stress cycle, we must understand the far-ranging consequences of excessive energy depletion without adequate energy renewal—which is what occurs when the stress response system remains in high gear for long periods of time. As we noted earlier, 80 percent of all medical illnesses are triggered or worsened by stress.

Chronic overexposure to stress hormones is one of the ways in which prolonged stress can undermine our health. Over time, too-high levels of epinephrine, norepinephrine, and cortisol can lead to loss of muscle mass, decreased sensitivity to insulin (a risk factor for



diabetes), high blood pressure, elevated cholesterol and triglycerides, cardiovascular disease, poor tissue repair, and suppressed immunity—not to mention impotence in men and the cessation of menstruation in women.

Of course, each of us is born with particular genetic vulnerabilities—our own weak link or Achilles' heel—that get challenged whenever we're subjected to chronic stress. Some people are more prone to heart disease, while others are vulnerable to cancer. Yet regardless of our genetic inheritance, scientists are beginning to suspect that one pivotal factor in the development of heart disease, high blood pressure, and many other illnesses is overactivation of the sympathetic nervous system and underactivation of the parasympathetic nervous system.⁶

What's more, a number of psychological conditions could point to an underlying stress/energy imbalance. For example, depression—which might be described as extreme, chronic activation of the stress response system—has reached epidemic proportions worldwide. In the United States alone, 16 percent of adults—or 35 million people—suffer from major depression severe enough to warrant treatment at some time in their lives.² These numbers do not account for cases of chronic low-level or subsyndromal depression, which researchers believe to be far more widespread. (We'll talk more about depression in chapter 9.)

The stress/energy imbalance can affect virtually every bodily system by manifesting itself as a host of serious health problems, including the following:

- Cardiovascular—high blood pressure, atherosclerosis, heart disease
- Neurological—impaired memory, concentration, and cognitive function; migraines and headaches; Parkinson's disease;



Alzheimer's disease and dementia; fibromyalgia; chronic fatigue syndrome

- Gastrointestinal—ulcers, irritable bowel syndrome, ulcerative colitis, Crohn's disease
- Immunological—rheumatoid arthritis and other autoimmune disorders; infections, including frequent colds, respiratory infections, and yeast infections; urinary disorders, such as frequent urges to urinate and pain upon urination; skin conditions; allergies; cancer
- Endocrine/metabolic—hypoglycemia, type 2 diabetes, menstrual irregularities, infertility, weight problems
- Musculoskeletal—muscle pain and spasms, neck and back pain, sciatica, temporomandibular joint pain
- Psychological—anxiety, panic disorder, post-traumatic stress disorder, depression, low sex drive, sexual dysfunction, sleep disorders, eating disorders, attention deficit disorder

THE STRESS - AGING CONNECTION

At the far end of the spectrum of complaints that may arise from a chronically stimulated stress response system—and the resulting stress/energy imbalance—is premature aging, along with age-related degenerative diseases such as atherosclerosis, Alzheimer's, diabetes, and osteoporosis. Despite this, centenarians now rank as the fastest-growing segment of the U.S. population.

In recent years, scientists studying longevity have advanced various theories to explain why some people live to a healthy old age and others don't. While genes may be important, the difference between longevity rates now and 100 years ago most likely stems from the



significant decrease in infant mortality at one end of the age spectrum and improved geriatric care at the other end. This is especially true now that medical interventions prevent many diseases from becoming fatal. In fact, it's beginning to appear that a normal human lifespan—barring accidents and life-threatening illness—is between 100 and 120 years!³

Although details of the complex relationship between stress and aging—involving both environmental and genetic factors—are still emerging, we have enough information to draw some basic conclusions. Not surprisingly, much of the current research suggests that an overactive stress response system seems to accelerate the aging process. According to one theory of aging known as metabolic remodeling, healthy centenarians show less damage to their cells than their less healthy peers. Metabolic remodeling is one of several theories of aging under investigation, as you'll see in chapter 4.¹

Overall, healthy centenarians tend not to overreact to stress, and are careful to replenish their energy stores to maintain their good health. The successful adaptation of their stress response systems contributes to their longevity.

Of course, since the beginning of time, we humans have been searching for the secret to living longer. Today scientists are developing keys to unlock the human genome, as well as new tools to probe the mysteries of aging. In the meantime, we're being bombarded by a vast and confusing arsenal of “miracle” pills and potions that make outrageous antiaging claims. Some provide limited benefit, but most do nothing; most are harmless, though a few might actually be detrimental to your health.

As with most aspects of our existence, there's bad news and good news in our quest for eternal youth. The bad news is that no single potion will extend our lives forever. The good news is that we can dramatically improve our quality of life by staying as healthy as



possible for as long as possible. Many people who adopt a healthy diet and lifestyle, and who do not suffer from chronic stress, are able to maintain a good quality of life up to 100 years of age—and sometimes beyond.

Sufficient energy is the sine qua non of good health. When we reviewed studies of the healthy elderly in the United States and abroad, we identified five factors as the essence of a long, productive, active life: a high-energy diet, physical and mental fitness, a strong social network, adequate sleep, and a clear, calm mind. We'll explore each one of these elements in depth in chapter 15.

In addition, because no one dwells in a stress-free utopia where life unfolds exactly according to plan, we recommend a regimen of herbal and nutritional supplements that have helped us and our patients maintain a healthy balance between energy expenditure and energy renewal. Our personal and clinical experience has taught us that an integrated approach, including the judicious use of *Rhodiola rosea* to help enhance the body's energy production, can help us live well and happily as we grapple with unprecedented demands and pressures on our time.

In other words, each and every one of us has the power to get—and stay—energized for life, even in the face of stress. *Rhodiola rosea* is vital to replenishing energy stores and maintaining that all-important stress/energy balance.